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Revised Site Characterization Work Plan

Cheat River Rail-Trail Corridor
VRP#20018

January 8, 2020

Prepared for:

Friends of the Cheat
343 North Preston Highway
Kingwood, WV 26537

Prepared by:

AECOM
12420 Milestone Center Drive
Germantown, MD 20876
aecom.com

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List of Acronyms

°C	degrees Celsius
AECOM	AECOM Technical Services, Inc.
B&O	Baltimore and Ohio
bgs	below ground surface
CoC	Chain-of-Custody
COPC	Constituent of Potential Concern
COPEC	Constituent of Potential Ecological Concern
CSEM	Conceptual Site Exposure Model
CSM	Conceptual Site Model
CSR	Code of State Regulations
DRM	Dose Rate Model
DQO	Data Quality Objective
ECSM	Ecological Conceptual Site Model
EDD	Electronic data deliverable
ERA	Ecological Risk Assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
FOC	Friends of the Cheat
ft	feet or foot
GW-SW	Groundwater-Surface Water
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
HZ	Hyporheic Zone
IDW	Investigative Derived Waste
LCS	Laboratory Control Spike
LRS	Licensed Remediation Specialist
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAP	National Environmental Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PA	Pennsylvania
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polycyclic Aromatic Hydrocarbon
PARCCS	Precision, Accuracy, Representatives, Completeness, Comparability, and Sensitivity

PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
redox	oxidation-reduction
ROW	Right-of-Way
RPD	relative percent difference
SOP	Standard Operating Procedure
SPLP	synthetic precipitation leaching procedure
SSS	Site-Specific Standard
USCS	Unified Soils Classification System
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
VRP	Voluntary Remediation Program
WV	West Virginia
WVDEP	West Virginia Department of Environmental Protection

1. Introduction

AECOM Technical Services, Inc. (AECOM), on behalf of the Friends of the Cheat (FOC), has prepared this Site Characterization Work Plan for the Cheat River Rail-Trail Corridor (the "Site") in Preston County, West Virginia (WV).

1.1 Purpose and Scope of Plan

The purpose of this document is to describe the following:

- Current site conditions;
- The conceptual site model (CSM), which defines the soil, geologic, and hydrogeologic conditions at the Site, including the potential human health and ecological exposure pathways and receptors; and
- A sampling and analysis plan that collects sufficient data to fill data gaps and meet the WV Department of Environmental Protection (WVDEP) Voluntary Remediation Program (VRP) requirements.

1.2 Report Organization

This Site Characterization Work Plan has been organized into the following sections:

- **Section 1.0** introduces information regarding purpose, scope, and general reporting structure;
- **Section 2.0** summarizes general Site conditions, surrounding property use, previous investigations, applicable regulatory framework, project personnel, and the October 2020 Site visit;
- **Section 3.0** describes the physical setting of the Site and the preliminary CSMs developed for both the human health risk assessment (HHRA) and ecological risk assessment (ERA);
- **Section 4.0** provides the investigation objectives, sampling and analysis plan, quality assurance plan, reporting requirements, and project schedule; and
- **Section 5.0** references documents used in the preparation of this report.

2. Site Background

These following subsections summarize the general Site conditions, surrounding property use, previous investigations, applicable regulatory framework, project personnel, and the October 2020 Site visit.

2.1 Site Location and Surrounding Uses

The Site property, a former railroad line right-of-way (ROW), is located in a mixed-use area of Preston County, WV. The location of the Site is shown on **Figure 2-1**. The property's tax parcel identification numbers are 6-41-13 and 01-17-42.1. The project corridor begins south of Kingwood, starting near Caddell Bridge (milepost 11.7, adjacent to Allegheny Wood Products), and runs south along the Cheat River approximately 9 contiguous miles parallel to the Cheat River and State Route 72 to Rowlesburg, WV. The project site ends near milepost 3.0, adjacent to Greer Industries' Cheat River Limestone operations. The rail bed averages approximately 30 feet (ft) in width, and the ROW averages 80 ft in width along the entire length of the site, totaling approximately 100 acres.

The general ecological setting of the Site consists of typical Allegheny Highlands vegetation and landforms (hardwood forests interspersed with intermediate shrub wetlands and boulders). Compacted gravel (ballast) covers most portions of the trail throughout the Site. The ROW runs along the western side of the Cheat River on the northern portion and then crosses over the Cheat River via a bridge and runs along the eastern side of the Cheat River. Several tributaries of the Cheat River intersect the Site. Approximately 94 drainage culverts channel surface runoff and connect the ROW to the downgradient Cheat River or adjacent wetlands. Within the ROW, shallow drainage depressions run parallel along portions of the trail. These drainage depressions either direct runoff into the culverts or, as seen in the northern portions of the ROW, act as vegetation buffers between State Route 72 and downgradient areas.

Undeveloped land owned by either Allegheny Forestlands LLC or FOC surrounds the majority of the Site; however, in several areas, the Site is adjacent to commercial/industrial properties, and, limited residences and seasonal homes do exist adjacent to the ROW. In the northern section of the Site, previously Chemetals Inc. (aka Volkstone Chemical), a former manganese plant, adjoins the ROW under investigation. The United States government owns the aforementioned northern portion of the ROW and uses adjacent land for training related to the Army National Guard's Camp Dawson. Further south, near Heather Run and the bridge crossing Cheat River, the west and east sides of the Site are adjacent to residential and seasonal properties.

2.2 Site History

The Site is a former railroad ROW previously owned by CSX Transportation, Inc. The Site had been developed as a railroad since at least 1907 and was formerly called the Morgantown and Kingwood Railroad and the Baltimore and Ohio (B&O) Railroad. CSX removed the railroad tracks in 2008; however, creosote-treated railroad ties still remain on portions of the rail corridor. The WV State Railway Authority currently owns the Site, which is currently leased by FOC.

The Site has been proposed for redevelopment by the FOC for recreational use as a "Rails-to-Trails" hiking and biking trail – referred to as the "Cheat River Trail". As currently envisioned, redevelopment will include construction of a trail cover for the ease and benefit of future trail walkers and bikers and replacement of several drainage culverts (Triad, 2012).

2.3 Previous Investigations

Several phases of environmental investigations and reports have been completed along the rail corridor for various interested parties, including a *Phase II Environmental Site Assessment*

(Triad, 2012), a *Human Health Risk Assessment* (RBR, 2012), and a *Supplemental Sampling Report* (AECOM, 2019).

In 2011, RBR collected unbiased soil samples in a diagonal pattern – selected to account for recreational visitors leaving the center of the trail. The samples were spaced approximately 800 ft apart. Twenty-two (22) samples were collected from the eastern portion of the ROW and designated as “SS#A”; seven samples were collected from the center portion of the ROW and designated as “SS#B”, and fifteen (15) samples were collected from the western portion of the ROW and designated as “SS#C”. In addition, five surface samples were collected in area observed to be trespassed frequently or desirable for off-trail use but still within the Site. These off-trail samples were designated as “SS#D”. One composite sample for polychlorinated biphenyls (PCBs) was collected adjacent to the former Chemetals, Inc. property and designated as “SS#P”.

A total of 15 surface soil samples were collected at approximate 210 ft intervals along the rail corridor on December 6, 2018. Following the CSXT Exhibit B Minimum Sampling Requirements, each sample was a composite of five specimens collected from the upper 6 inches of soil at each location area. The sample locations were sequentially numbered SB-1 through SB-15.

Appendix A present the soil sampling results from the previous 2011 and 2018 soil sampling events, respectively. Constituents of potential concern (COPCs) were identified based on a comparison of the surface soil data to West Virginia Residential De Minimis Screening Levels (WVDEP, 2020). These previous studies identified the following eight COPCs:

- Arsenic
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

To further assess potential impacts to future recreators of the Cheat River Trail, site-specific standard (SSS) recreator screening values were developed for each soil COPC. Both adult and child recreator receptors were considered in the screening value development. Exposure factors recommended by WVDEP for recreational land use were used in conjunction with the United States Environmental Protection Agency’s (USEPA’s) Regional Screening Level On-Line Calculator to derive the SSS screening values (WVDEP, 2020). The SSS recreator screening values were based on the lower (most conservative) value of those derived for carcinogenic and non-carcinogenic endpoints. **Appendix A** identifies the SSS recreator screening values for each COPC identified in surface soil. The calculator output is provided in **Appendix B**.

SSS recreator screening values for constituents with carcinogenic effects were based on an excess cancer risk of 1 in 1,000,000 (1×10^{-6}) to account for cumulative risk. SSS recreator screening values for COPCs with non-carcinogenic effects were based on a hazard quotient (HQ) of 1 due to the limited number of COPCs. The future recreator screening identified the following two (2) COPCs:

- Arsenic
- Benzo(a)pyrene

Figures 2-2 through 2-5 present the locations for samples collected during the 2011 and 2018 events and exceedances of the SSS recreator screening value.

2.4 Regulatory Framework

Site work will be prepared pursuant to the requirements of WVDEP Voluntary Remediation and Redevelopment Rule (W. Va. Legislative Rule 60CSR3), Voluntary Remediation and Redevelopment Act (W. Va. Code § 22-22-1, et seq.), and the WVDEP VRP Guidance Manual

(WVDEP, 2020). Per WVDEP VRP guidance, a Licensed Remediation Specialist (LRS), licensed by WVDEP, will oversee all investigation/remediation activities.

2.5 Project Personnel and Roles

The Project Manager and LRS are Owen Mulkeen (FOC) and Matthew Watson (AECOM), respectively. Field activities described within this report will be led by Jason Newman (AECOM). The subsequent risk assessments will be performed by Kaylin Lewine (AECOM, Human Health Risk Assessment [HHRA]) and Adam Dec (AECOM, Ecological Risk Assessment [ERA]), with senior review provided by Gretchen Welshofer (AECOM).

Key project personnel and subcontractors for the current project phase are listed below along with their associated primary roles.

Project Chain of Command and Project Roles

Friends of the Cheat-Applicant
Amanda Pitzer – Director
Owen Mulkeen – Associate Director

WV State Railway Authority – Property Owner
Cindy Butler – Director

AECOM Technical Services
David Weaver – Project Manager
Matthew Watson – LRS
Gretchen Welshofer – Senior Risk Assessor
Kaylin Lewine – Risk Assessor
Jake Wilhelm – Risk Assessor
Tara Bhat – Project Chemist
Jason Newman – Lead Field Technician
Kevin Booton – Field Technician

Downstream Strategies
Marc Glass – Technical Support

WVDEP
Matt Gadd – Office of Environmental Remediation Project Manager
Ross Brittain – Environmental Toxicologist

Subcontractors
Enviroprobe – Drilling Contractor
Pace Analytical – Laboratory Contractor
Capital Services – Waste Contractor

2.6 Summary of October 2020 Site Visit

Members from FOC (Owen Mulkeen) and AECOM (David Weaver, Matthew Watson, and Adam Dec) met with WVDEP (Matt Gadd and Ross Brittain) on October 9, 2020 to go over general expectations regarding VRP implementation and options available to assess potential risk at the Site. Given knowledge of potential impacts to human receptors and lack of previous ecological risk assessments, AECOM (Adam Dec) presented the current SSS proposals for both the HHRA and ERA to WVDEP (Ross Brittain) and the overall project team. WVDEP (Ross Brittain) explained the other options available (i.e., De Minimus and Uniform Standards) for FOC and AECOM to explore pending the proposed sampling efforts.

After this initial meeting, the project team began the Site visit by crossing the former rail bridge across the Cheat River to follow the ROW south along the eastern portion of the Site. Some permanent and seasonal residences were noted adjacent to the ROW. Additionally, representative culverts were shown to indicate the potential migration of sediment from the drainage depressions that run parallel to the ROW and feed directly into the culverts and subsequently the Cheat River. The project team moved to the northern section of the ROW associated with the Army National Guard training areas. WVDEP noted that the hydraulic regime noticeably changes within this northern portion, and attention would need to be paid towards migration into the downgradient forested/shrub wetlands. Additionally, WVDEP noted that drainage depressions along this section were more likely to be altered by a future utility worker due to proximity near the roadside and other vegetation buffers.

At the conclusion of the Site visit, the project team discussed the proposed sampling efforts and use within the SSS HHRA and ERA reports. The items discussed are summarized below:

- Soil samples will be collected to supplement current soil dataset and provide opportunity for a 10 percent % Stage 4 Data Validation;
    - Surface soil will be defined as the first 0 to 2 ft depth interval below the ballast, where native soil supports vegetation.
    - Previously collected soil samples north and south of the VRP Site boundary will be used within the risk assessments to evaluate overall exposure across the Site. The areas outside of the VRP Site boundary are not owned by FOC and cannot be included within the current VRP application. However, they do exist between the trail start and endpoint and would provide a more accurate representation of exposure.
- Eight (8) representative culverts will be selected during the upcoming field investigation to provide co-located, upgradient sediment and synthetic precipitation leaching procedure (SPLP) and downgradient sediment; and
    - Upgradient sediment will be biased towards the entrance of each culvert.
    - Upgradient SPLP results will be used to evaluate potential surface migration of COPCs into groundwater.
    - Downgradient sediment will be collected at the base of each culvert prior to discharge into the Cheat River.
    - Due to the varied substrate, terrain, and surrounding habitat of the 90 plus culverts, determinations within the field will be made for specific locations.
        - At least two culverts from the northern portion of the trail will be sampled to evaluate ecological impacts to downgradient wetlands.
- Due to the rural nature of the trail, the future recreator will be evaluated using the camping scenario as described within Appendix C of WVDEP (2020) – representing exposure of 14 days per year for 24 hours per day.

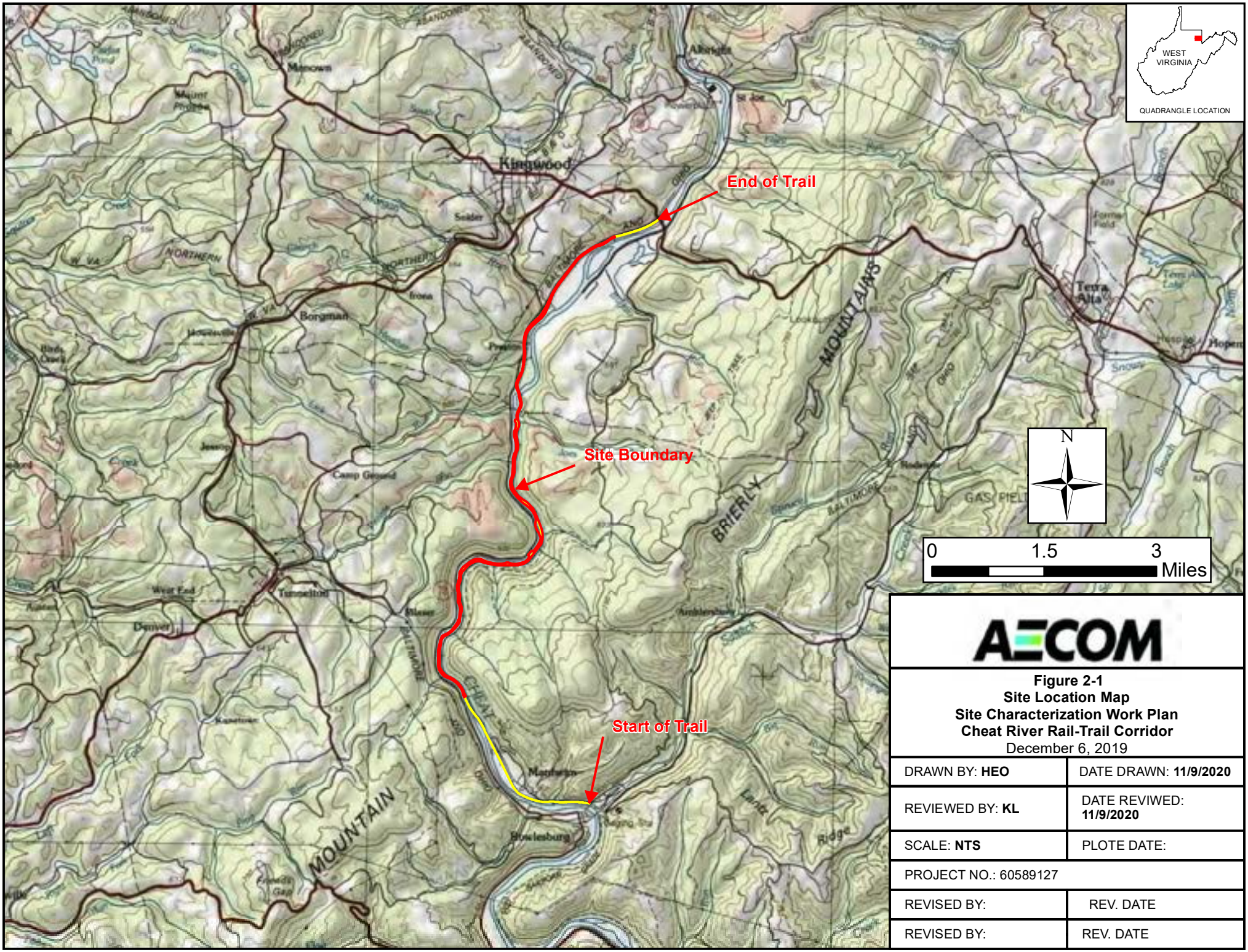

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Figure 2-1
Site Location Map
Site Characterization Work Plan
Cheat River Rail-Trail Corridor
December 6, 2019

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REVIEWED BY: **KL**	DATE REVIWED: **11/9/2020**
SCALE: **NTS**	PLOTE DATE:
PROJECT NO.: 60589127	
REVISED BY:	REV. DATE
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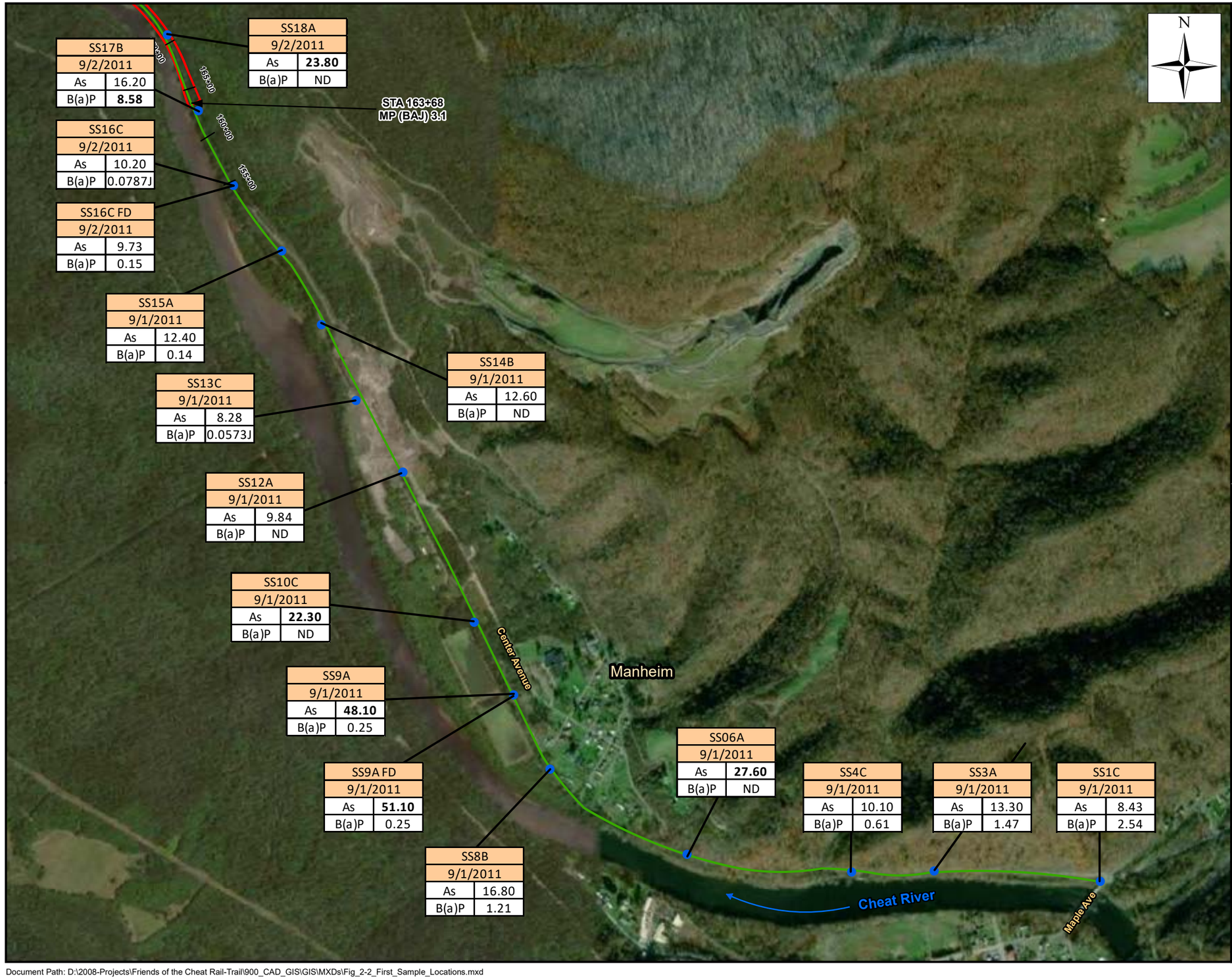
Match Line - See Figure 2-3



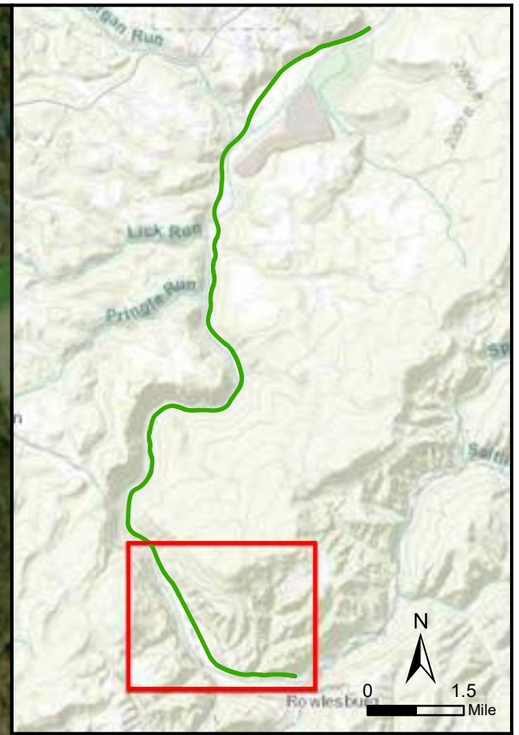


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Figure 2-2
Existing Sampling Locations and Data Summary
(Downgradient 1)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Existing Sampling Locations
- Site Boundary
- Rail-Trail
- 160+00 Station Location

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

GIS BY: **HEO**	DATE MODIFIED: **1/7/2021**
REVIEWED BY: **KL**	DATE REVIWED: **1/7/2021**
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Match Line - See Figure 2-4

SS40C	
9/2/2011	
As	9.98
B(a)P	ND

SS39A	
9/2/2011	
As	**23.80**
B(a)P	0.69

SS3D	
9/2/2011	
As	15.70
B(a)P	0.09

SS2D	
9/2/2011	
As	4.88
B(a)P	**1.67**

SS37C	
9/2/2011	
As	4.29
B(a)P	0.35

SS36A	
9/2/2011	
As	5.41
B(a)P	0.25

SS35B	
9/2/2011	
As	6.31
B(a)P	0.57

SS34C	
9/2/2011	
As	7.01
B(a)P	0.0528J

SS33A	
9/2/2011	
As	13.10
B(a)P	**7.17**

SS30A	
9/2/2011	
As	**23.10**
B(a)P	0.90

SS28C	
9/2/2011	
As	**62.90**
B(a)P	0.11

SS27A	
9/2/2011	
As	7.36
B(a)P	ND

SS25C	
9/2/2011	
As	6.11
B(a)P	ND

SS24A	
9/2/2011	
As	8.82
B(a)P	0.50

SS19C	
9/2/2011	
As	**61.70**
B(a)P	0.15

SS1D	
9/2/2011	
As	**25.00**
B(a)P	0.14

SS21A	
9/2/2011	
As	**20.90**
B(a)P	ND

MP (BAJ) 6.0
MP (BAJ) 5.0
MP (BAJ) 4.0
WV-72 River Road
Cheat River
350+00
345+00
340+00
335+00
330+00
325+00
320+00
315+00
310+00
305+00
300+00
295+00
290+00
285+00
280+00
275+00
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175+00

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Match Line - See Figure 2-2

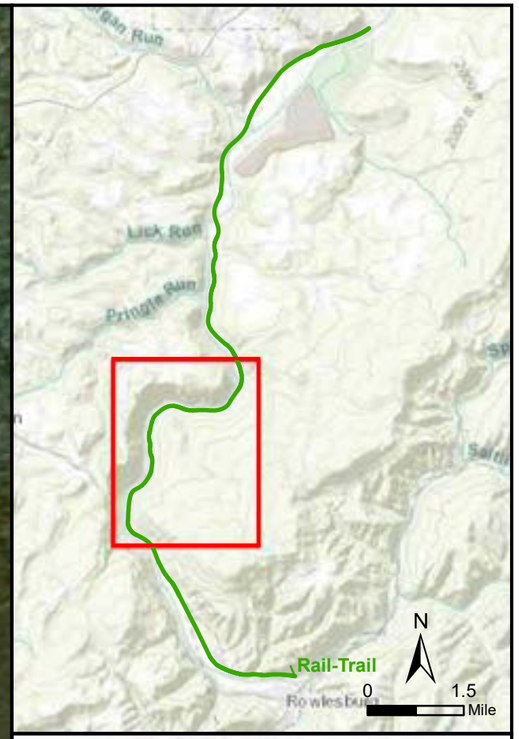

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Figure 2-3
Existing Sampling Locations and Data Summary
(Downgradient 2)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Existing Sampling Locations
- Site Boundary
- Rail-Trail
- 185+00 Station Location

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

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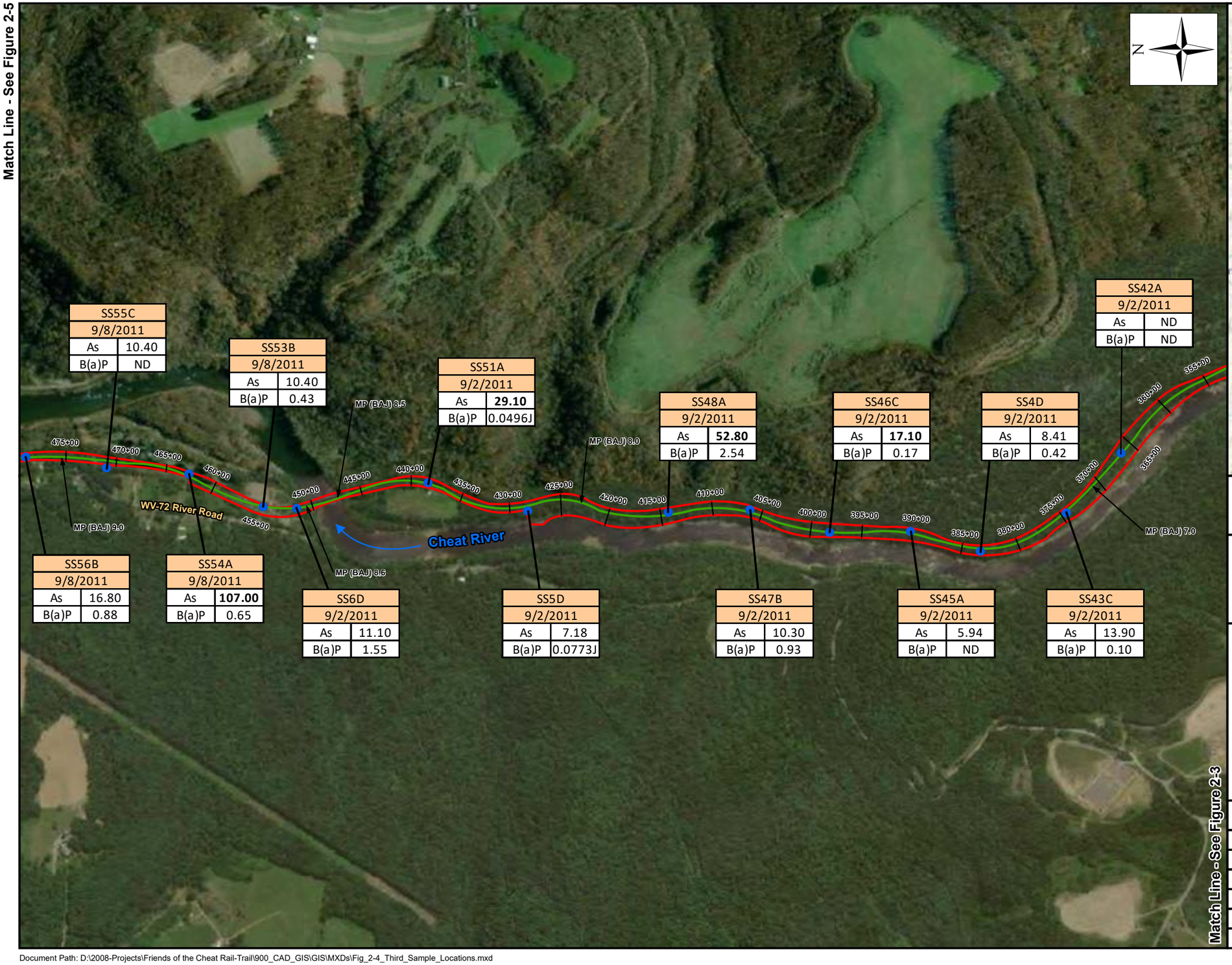
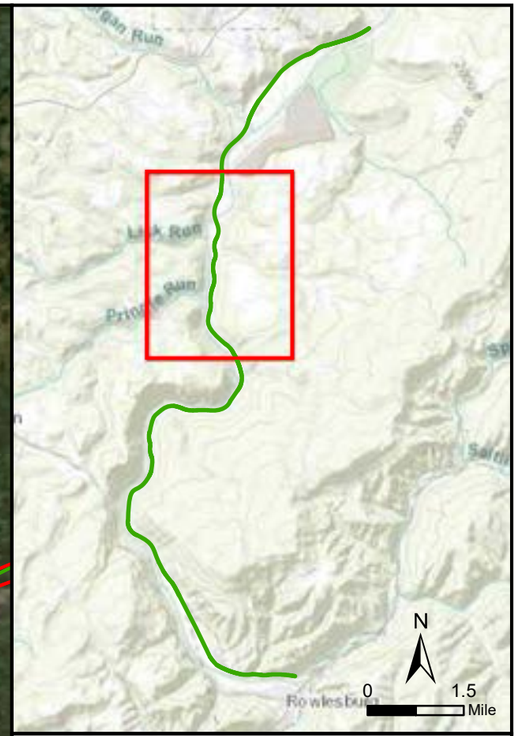
Match Line - See Figure 2-5





AECOM

Figure 2-4
Existing Sampling Locations and Data Summary
(Upgradient 1)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Existing Sampling Locations
- Site Boundary
- Rail-Trail
- 355+00 Station Location

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

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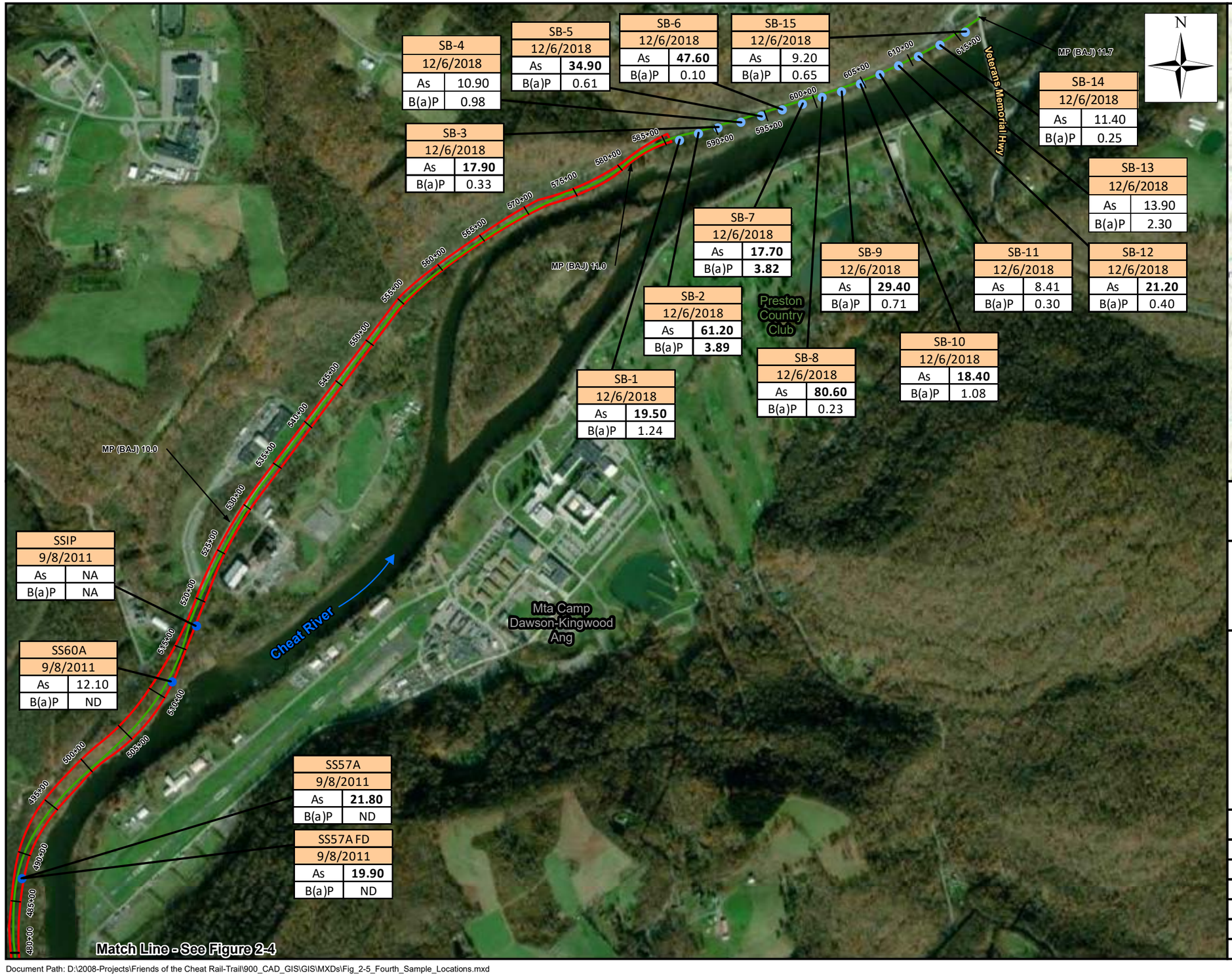

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Figure 2-5
Existing Sampling Locations and Data Summary
(Upgradient 2)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Existing Sampling Locations, 2018
- Existing Sampling Locations, 2011
- Site Boundary
- Rail-Trail
- 480+00 Station Location

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
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0 0.25 0.5 Miles

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3. Preliminary Conceptual Site Model

A preliminary CSM was developed based on historical operations, environmental investigation data, the general Site setting, physical and chemical properties of Site-related constituents of interest, and potential human health and ecological receptors and exposure pathways. The preliminary CSM is comprised of three sub-models: a hydrogeologic model that describes physical site features that may influence environmental conditions, an ecological CSM (ECSM) that identifies potential migration routes, valued habitat, and ecological receptors that may be impacted by historical operations, and a conceptual site exposure model (CSEM) for potential human receptors. The following sections describe each of the sub-models.

3.1 Physical Setting

This subsection describes the physical setting of the Site and details processes (hydrogeology and surface hydrology) that were used to formulate the preliminary CSM.

3.1.1 Site Geology

The Site lies within the Allegheny Highlands subsection of the Appalachian Plateau Physiographic Province. The Allegheny Highlands consists predominantly of deeply dissected, Pennsylvania-Mississippian (Lower-Middle Carboniferous) aged, clastic, sedimentary rocks such as sandstone, siltstone, and shale interbedded with coal and some limestone. The bedrock is gently folded, with the main structural features being the Kingwood Syncline and the Briery Anticline. The oldest rocks along the trail outcrop in the vicinity of Rowlesburg, WV, along the eastern flank of the Briery Anticline. The Mississippian aged Greenbrier Limestone is quarried in the area. The youngest rocks along the trail follow the in axis of the Kingwood syncline represented by the Allegheny Group, which is noted for by the presence of coal seams that have been extensively mined in the area (Hennen and Reger, 1914).

The unconsolidated materials at the Site are predominantly silt loams, with some sandy loams from the Dekalb, Buchanan, Ernest, Gilpin series, which consist of moderately deep, well-drained soils that formed in recent sandstone and shale residuum (USDA, 2004 and 2020). Finer-grained materials grade to more gravelly deposits with depth. Soils are on nearly level to very steep uplands and ridges. Anthropogenic fill materials associated with the former railroad construction and maintenance activities are encountered along the roadways and other areas of modified land surface.

3.1.2 Site Hydrology and Hydrogeology

Groundwater in the colluvial material along the valley slopes and tributaries valleys is expected to occur along the soil-bedrock interface and flow down-slope following the bedrock surface topography. The groundwater within the alluvial material associated with the main Cheat River Valley and larger tributaries is expected to be encountered by course-grained alluvium with cobbles and boulders. Groundwater elevation and flow direction are expected to be highly influenced by the bedrock topography significant down valley component generally following the top of the underlying the bedrock. At higher river stage conditions, local groundwater flow direction could vary temporarily away from the river.

3.1.3 Surface Water

The portion of the Cheat River that borders the site is classified by WVDEP as a “Tier 1” waterway. All waters in WV are assigned to specific tiers depending upon the level of protection necessary to maintain high quality and/or existing uses. The higher the tier, the more stringent the requirements are for protection. A Tier 1 waterway is considered impaired due to specific

pollutant, which for this section of the Cheat River, is fecal coliform. In addition, various tributaries to the Cheat are impaired due to metals and pH (FOC, 2005).

3.2 Preliminary Human Health Conceptual Site Exposure Model

A preliminary CSEM was developed to identify potential exposure pathways and human receptors that may be exposed to Site-related constituents detected in environmental media, and to support scoping of the site assessment investigations. In developing the CSEM, Site-related COPCs, environmental fate and transport mechanisms, current and potential future land uses, and site and vicinity populations were considered. The preliminary CSEM is summarized on **Figure 3-1**. Discussion regarding potential migration and exposure pathways, and potential receptors considered in the preliminary CSEM, and the basis for identifying potentially complete and incomplete pathways is provided below.

The CSEM will be updated as part of the HHRA to be conducted following completion of the Supplemental Site Assessment investigation, and the final CSEM will be presented in the HHRA Report for the Site.

3.2.1 Potential Transport Mechanisms

Potential migration pathways for COPCs in environmental media at the Site were identified based on readily available information regarding chemical and physical properties of potential COPCs, and the physical, topographic, and hydrologic conditions at the Site. Environmental media within the vicinity of the Site include soil, sediment, groundwater, and surface water. As discussed previously, COPCs for the Site are polycyclic aromatic hydrocarbons (PAHs) and metals. COPCs may be presently adsorbed to soils, sediment and/or dissolved in groundwater/surface water. PAHs are typically of low volatility and solubility, thus lateral migration from source areas is generally limited. Metals are naturally occurring and may be ubiquitous at background concentrations in site media. Metals are typically of low solubility, thus their presence in dissolved phase and potential for migration in the subsurface is typically limited. Given these considerations, migration and transport of COPCs to potential human receptors is limited to the following potential migration pathways:

- Airborne transport of dust (particulates) from onsite exposed surface and subsurface soils resulting from wind erosion or physical disturbance of soils;
- Volatilization and vapor transport of volatile PAHs in soils and groundwater to outdoor air;
- Overland transport of COPCs in sediment and surface water; and
- Migration of dissolved constituents in groundwater to surface water onsite and/or in the Cheat River.

3.2.2 Potential Receptors

Potential receptors are defined as human populations or individuals and environmental systems that are susceptible to constituent exposure from the Site. Both current and future land use conditions are considered in identifying potential receptors and exposure scenarios.

The current and future potential receptors include the on-site child and adult park recreator and outdoor park worker. Outdoor workers are defined as adults who perform work activities exclusive of subsurface disturbance activities (e.g., digging and excavation).

The future-only exposure scenarios, which is used to address site conditions that have changed due to land re-development and/or other potential excavation activities, include the on-site utility worker and the construction worker. Soil excavation activities with possible land re-development could bring subsurface soil to the surface, and the soils are “mixed” together creating a total soil

exposure point (i.e., soil depths ranging from 0 to 10 ft below ground surface [bgs]). Construction and utility workers are defined as outdoor workers who perform subsurface disturbance work such as digging and excavation, and construction, maintenance, repair, and/or demolition of equipment, utilities or other structures.

3.2.3 Potential Exposure Pathways

An exposure pathway is comprised of the following:

- A source and mechanism of constituent release to the environment;
- A transport or exposure medium containing the constituent;
- An exposure point where receptors (humans) can contact the exposure medium; and
- An exposure route (e.g., inhalation, ingestion, direct contact).

All of these above elements must be present for an exposure to occur. The absence of any one of these elements results in an incomplete exposure pathway for which Site-related risks do not currently exist or are not expected to occur in the future.

Based on the potential migration pathways and the nature of Site-related COPCs discussed above, the following potential exposure pathways were considered in the preliminary CSEM.

- Direct (dermal) contact with COPCs in soil and groundwater;
- Incidental ingestion and inhalation of COPCs in dust and particulate matter;
- Inhalation of volatile COPCs in outdoor air; and
- Direct contact and incidental ingestion of COPCs in surface water and sediment.

Volatile constituents present in soil can be released to ambient air through volatilization, one of the constituents identified as a COPC for soil is considered to be sufficiently volatile (benzo[a]anthracene); therefore, inhalation of volatile constituents in ambient air is considered a potential exposure pathway.

3.2.4 Potentially Complete and Incomplete Pathways

As previously noted, all four elements of an exposure pathway must be present for an exposure to occur. Mitigating factors are also considered in evaluation of the completeness of an exposure pathway using logical and scientifically defensible reasoning based on site-specific understanding of site conditions and operations. Mitigating factors may include covers that minimize the potential for direct contact, water use restrictions and other institutional controls established to minimize worker exposure, and/or the nature of COPC. Mitigating factors on-site under current use and operations include the following:

- Gravel, asphalt paving, or vegetated cover on the majority of site soils, which serves to mitigate potential dust generation and
- The site deed restricts site use to recreational only and prevents residential use and potable use of groundwater.

The following are the potentially complete pathways:

- Current/future adult/child recreator: The child (ages 0 to 6 years old) and adult recreator visit the site for recreational purposes and are assumed to be exposed to surface soil (current) and total soil (future), as well as sediment, surface water, and groundwater. Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates and/or vapors from soil. Sediment and surface water-related exposure pathways include incidental ingestion and dermal contact. The

recreator would be exposed to groundwater via inhalation of vapors migrating from groundwater to outdoor air.

- Current/future outdoor park worker: The outdoor park worker periodically visits the Site to inspect the property and conduct outdoor maintenance activities. The outdoor worker is assumed to be exposed to surface soil (current) and total soil (future), as well as sediment, surface water, and groundwater. Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates and/or vapors from soil. Sediment and surface water-related exposure pathways include incidental ingestion and dermal contact. The worker would be exposed to groundwater via inhalation of vapors migrating from groundwater to outdoor air.
- Future construction worker: The future on-site construction worker is assumed to be involved in a year-long construction project at the Site. Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates and/or vapors from total soil (0 to 10 ft bgs). Groundwater at the site is expected to be above 10 ft; therefore, incidental ingestion, dermal contact, and inhalation of groundwater vapors with shallow groundwater seeping into an excavation trench was evaluated. The excavation is estimated to extend to approximately 10 ft bgs.
- Future utility worker: Soil-related exposure pathways for the future on-site utility worker include incidental ingestion, dermal contact, and inhalation of wind-blown particulates and/or vapors from total soil (0 to 10 ft bgs). Groundwater-related exposure pathways include inhalation of vapors from groundwater in a utility line trench, which anticipated to extend to 4 ft bgs. Exposure for the utility worker will be based on parameters listed by the Risk Assessment Information System (https://rais.ornl.gov/index.html) for the excavation worker.

3.3 Preliminary Ecological Conceptual Site Model

A preliminary ECSM was developed to depict the potential source areas, exposure media, and migration pathways used to identify significant exposure pathways for evaluation in the ERA Report (**Figure 3-2**). The ECSM will be further refined within the ERA Report based on findings from the planned investigation. The ECSM includes the following information:

- Potential source area(s)
- Potential migration pathways
- Exposure media
- Complete and incomplete exposure pathways for potential ecological receptors via the following exposure routes:
    - Direct contact/absorption
    - Direct or incidental ingestion of substrate
    - Ingestion of prey and plant dietary items

Potential Source Area(s)

The potential source area within the Site is related to the former railroad ROW previously owned by CSX Transportation, Inc. The project corridor varies in width and averages about 80 to 90 feet wide and extends approximately 9 miles parallel to the Cheat River and State Route 72 (roughly 100 acres). Previous investigations have indicated potential impacts related to degradation of creosote-treated railroad ties located within the rail corridor. The Site is no longer used as a railway corridor; however, treated railroad ties may be still present, and the Site is being proposed for redevelopment to allow access for recreational users.

Potential Migration Pathway(s)

The evaluation and identification of potentially complete migration pathways is one of the primary goals of an ERA (USEPA, 1997). As defined, a "migration pathway" is the pathway by which a constituent travels from a source to receptors. A pathway can involve multiple media such as erosion of soil to stream sediments, or volatilization to the atmosphere. Historical releases to soil/weathering of creosote treated railroad ties and subsequent erosion/dissolution of constituents (i.e., metals and PAHs) into groundwater and transport to the environment within and around Cheat River represent the primary release mechanisms at the Site.

Migration pathways that will be evaluated within the ERA Report include:

- Erosion of surface soil
    - The railroad corridor is elevated above the Cheat River with a steep slope leading into the Cheat River (approximately 40 vertical feet over a 150-ft distance to the river in upstream areas). Given the topography and orientation relative to aquatic environments, stormwater runoff from significant rain events could transport suspended substrate off-Site to the Cheat River.
- Groundwater discharge to the Cheat River
    - Groundwater discharge to semi-aquatic and aquatic habitats associated with the Cheat River may potentially occur as upwelling within the groundwater-surface water (GW-SW) transitional zone or hyporheic zone (HZ). USEPA defines the GW-SW transition zone as "a region beneath the bottom of a surface-water body where conditions change from a ground-water dominated to surface-water dominated system within the substrate." (USEPA, 2008a).
    - The transitional zone also includes the HZ, which represents the interface of groundwater, sediment, sediment porewater, and surface water. USEPA defines the HZ as a "latticework of underground habitats through the sediments associated with the interstitial waters in the substrate beneath and adjacent to moving surface-waters." (USEPA, 2008a).

3.3.1 Potential Ecological Receptors and Relevant Exposure Routes

The ERA Report will present a formal description of habitats and potential ecological receptors (both common and rare/sensitive, as applicable) within and near the Site. The information presented will be compiled from field activities during this investigation, historical reports for the Site, and a desktop review of state and federal resources. Potential wildlife receptors not confirmed during field activities will be reviewed using online databases such as NatureServe.

Within the ERA Report, impact to potential ecological receptors will be assessed using surrogate species commonly used within ERAs for their availability of relevant exposure and life history studies (USEPA, 1993 and 2007; Sample and Suter, 1994). These surrogate species will provide an assessment endpoint to the overall management goal of maintaining wildlife populations and communities. Terrestrial and aquatic ecological receptors proposed for the ERA Report may be modified depending on the potential for rare/sensitive species. The proposed receptors and relevant exposure routes are listed below:

- Terrestrial receptors (surface soil; 0 to 2 feet)
    - Terrestrial plant community (direct contact/exposure to soil)
    - Soil macroinvertebrate community (direct contact/exposure to soil)
    - Terrestrial wildlife (incidental ingestion of soil and ingestion of prey items)
        - Mammalian herbivore: Deer mouse (*Peromyscus maniculatus*)

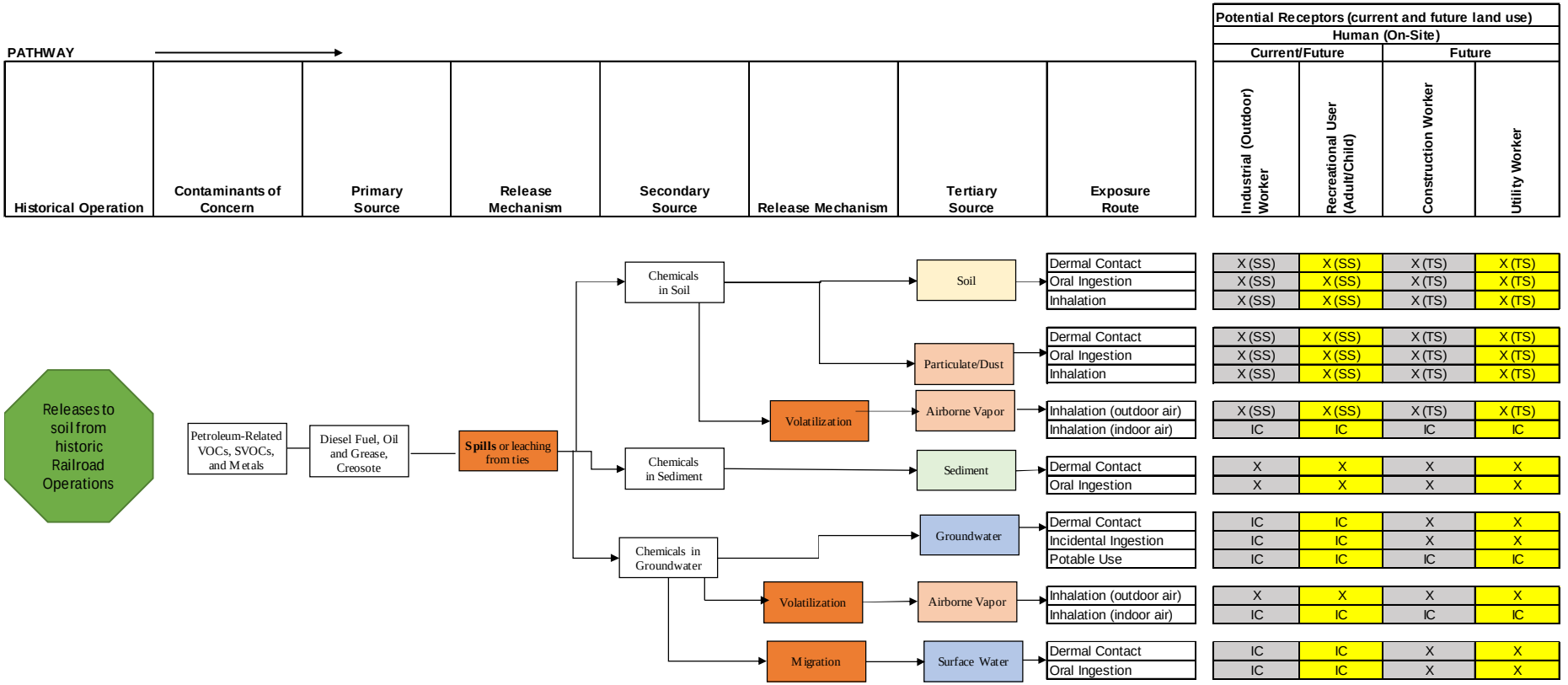
        - Mammalian invertivore: Short-tailed shrew (*Blarina brevicauda*)
        - Mammalian carnivore: Gray fox (*Urocyon cinereoargenteus*)
        - Avian herbivore: American woodcock (*Scolopax minor*)
        - Avian invertivore: American robin (*Turdus migratorious*)
        - Avian carnivore: Red-shouldered hawk (*Buteo lineatus*)
- Aquatic and semi-aquatic receptors (sediment and surface water)
    - Benthic macroinvertebrate community (direct contact/exposure to sediment and surface water)
    - Aquatic and semi-aquatic wildlife (incidental ingestion of sediment, direct ingestion of surface water, and ingestion of prey items)
        - Mammalian invertivore: Little brown bat (*Myotis lucifugus*)
        - Mammalian piscivore: American mink (*Neovison vison*)
        - Avian invertivore: Spotted sandpiper (*Actitis macularius*)
        - Avian piscivore: Osprey (*Pandion haliaetus*)

3.3.2 Management Goals with Assessment and Measurement Endpoints

The evaluation of the previously listed ecological receptors and exposure routes will allow the ERA Report to focus on the specific management goals for the Site. The management goals with applicable assessment and measurement endpoints are identified below:

Management Goal	Assessment Endpoint	Measurement Endpoint
Limit potential for adverse effects to ecological receptors via direct exposure routes.	Survival, growth, and reproduction of the soil macroinvertebrate community.	Comparison of constituent concentrations in soil to ecotoxicity benchmarks for soil macroinvertebrates.
	Survival, growth, and reproduction of the benthic macroinvertebrate community.	Comparison of constituent concentrations in sediment and surface water to ecotoxicity benchmarks for benthic macroinvertebrates.
Limit potential for adverse effects to ecological receptors via prey items and potential bioaccumulation.	Survival, growth, and reproduction of the avian/mammalian herbivore communities.	Comparison of modeled daily doses for constituents above wildlife benchmarks to a toxicity reference value).
	Survival, growth, and reproduction of the avian/mammalian invertivore communities.	
	Survival, growth, and reproduction of the avian/mammalian carnivore/piscivore communities.	

Figure 3-1 Preliminary Conceptual Site Exposure Model



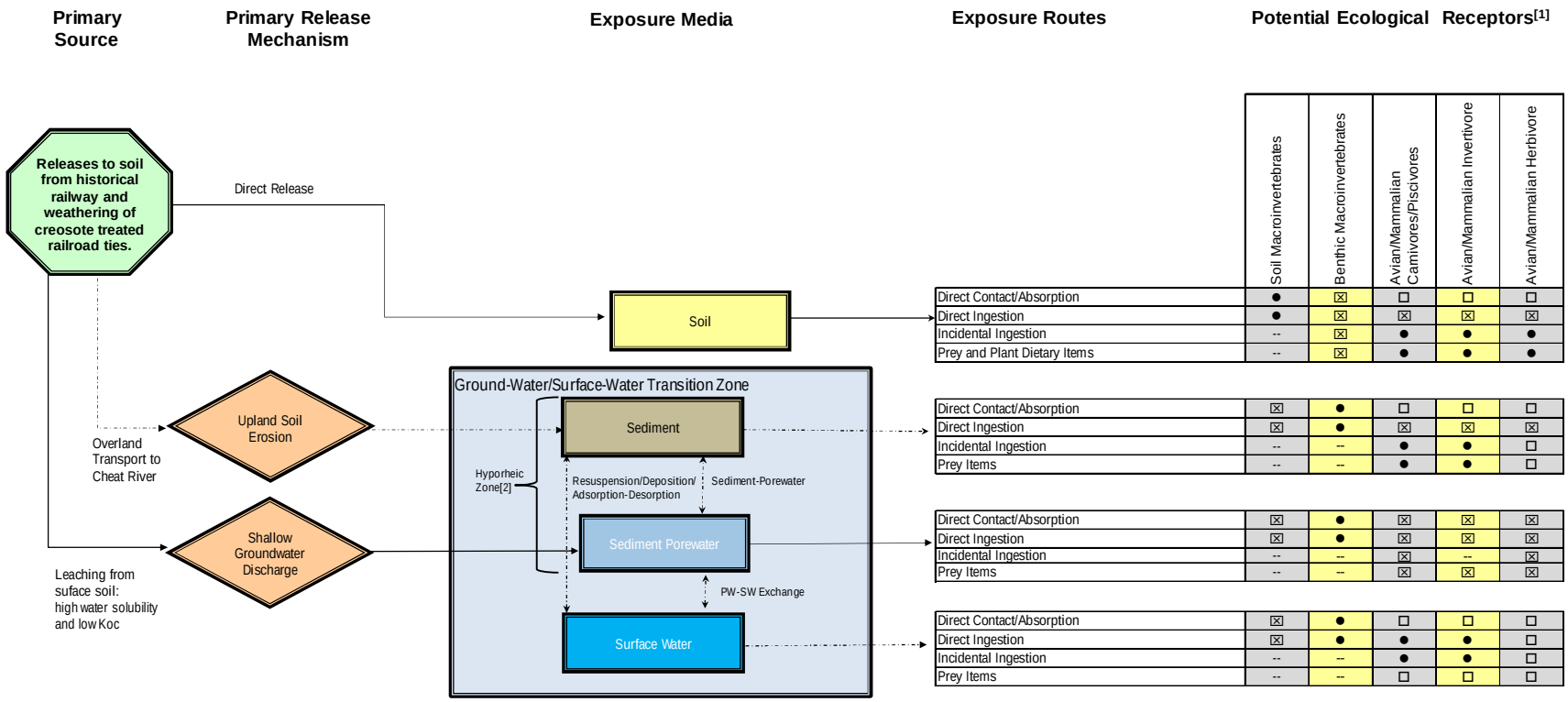
Notes:

1 The site deed restricts property use to recreational only and prevents residential use and potable use of groundwater.

X = Potentially Complete Exposure Pathway
IC = Incomplete Exposure Pathway
X (TS) = Exposure medium is total soil
X (SS) = Exposure medium is surface soil

Figure 3-1
Preliminary Conceptual Site Exposure Model
Site Characterization Work Plan
Cheat River Rail-Trail Corridor, West Virginia

Figure 3-2 Preliminary Ecological Conceptual Site Model



NOTES:
[1] Terrestrial wildlife receptors will be evaluated using exposure via soil and aquatic/semi-aquatic receptors will be evaluated using via sediment and surface water in the ERA Report.
[2] The hyporheic zone is defined as a "latticework of underground habitats through the sediments associated with the interstitial waters in the substrate beneath and adjacent to moving surface-waters" (USEPA, 2008).

REFERENCES:
USEPA. 2008. ECO Update/Ground Water Forum Issue Paper: Evaluating Ground-Water/Surface-Water Transition Zones in Ecological Risk Assessments. Publication 9285.6-17 EPA-540-R-06-072. July 2008.

LEGEND:

→	CONTAMINANT MIGRATION PATHWAY
·→	POTENTIAL CONTAMINANT MIGRATION PATHWAY
●	POTENTIAL COMPLETE PRIMARY EXPOSURE PATHWAY
☐	EXPOSURE PATHWAY IS COMPLETE OR POTENTIALLY COMPLETE AND INSIGNIFICANT
--	SIGNIFICANCE OF EXPOSURE PATHWAY IS UNCERTAIN
☒	INCOMPLETE EXPOSURE PATHWAY

Figure 3-2
Preliminary Ecological Conceptual Site Model
Site Characterization Work Plan
Cheat River Rail-Trail Corridor, West Virginia

4. Supplemental Site Assessment

4.1 Objectives of the Assessment

The development of project objectives includes the proper planning, evaluation of existing data, and the incorporation of regulatory requirements into the next phase of the project. As required by VRP, a site must be assessed to identify actual or potential contaminants at a site. The Supplemental Site Characterization should be performed with the following objectives in mind:

- Identification of Site-related contaminants reasonably expected to be at or near the Site;
- Determination of the presence or absence of those contaminants in a media of concern;
- Identification of the nature and extent of contamination;
- Identification of potential pathways for contaminant migration; and
- Identification of potential receptors of the contamination.

Based on recent and historical investigations of the properties, it is believed that most of the objectives have been met, but additional data are still needed to complete the characterization and requisite 10% USEPA Stage 4 protocols. The following sections describe the data gaps and the information that will be required to complete the characterization.

4.1.1 Human Health Assessment Data Gaps

The historical sampling data collected prior to entering the Site into the VRP were focused on surface soils. Sufficient samples were collected to be representative of the COPC within the former rail corridor; however, 10% of the data were not validated to USEPA Stage 4 protocols. Therefore, to allow the data to be used as part of the risk assessment process, additional surface soil samples will be collected. In addition to the soil data gap samples, subsurface soil, sediment, and SPLP samples will be collected and analyzed to further assess potential pathways and exposure points.

4.1.2 Ecological Screening Evaluation Data Gaps

An initial comparison of maximum detected concentrations of chemicals in soil from the Supplemental Sampling Report (AECOM, 2019) to De Minimis Standard ecological benchmarks indicates a potential for adverse impacts to ecological receptors and are summarized below:

- Below De Minimis Standard ecological soil benchmarks: acenaphthene, fluoranthene, fluorene, phenanthrene, and pyrene.
- Exceeded De Minimis Standard ecological soil benchmarks: arsenic, lead, anthracene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene.

Based on the preliminary ECSM (**Section 3.3**), potential source areas associated with the Site and historical activities exist and have the potential to transport constituents to downgradient aquatic environments. Further investigation of other environmental media is required to evaluate current uncertainties related to a lack of downgradient soil, sediment, and surface water.

In addition to uncertainties regarding direct contact/exposure, wildlife modeling has not been conducted for this Site to assess the potential for bioaccumulative impacts. Based on the data collected to support this investigation, wildlife receptors (as described within **Section 3.3.1**) will be evaluated using benchmarks protective of wildlife (in addition to direct contact/exposure) during the screening step of the ERA Report. An exceedance of wildlife benchmarks will be used to identify constituents for further evaluation using wildlife dose rate models (DRMs) as

outlined within USEPA (1997) and modified according to the SSS models presented within WVDEP (2020). In addition to resources outlined within WVDEP (2020), the following may be used to compile information for the wildlife DRMs and ERA Report:

- The resources listed below are preliminary and other references (as outlined in WVDEP [2020]) may be used depending on the specific constituents and receptors modeled.
- Supporting information from USEPA (1993) and Sample and Suter (1994) will be used to compile exposure assumptions related to wildlife receptors (i.e., dietary components, body weight, and home range).
- Allometric ingestion rate models from Nagy (2001) will be used within the wildlife DRMs.
- Bioaccumulation from soil/sediment into dietary components will be modeled using uptake models described in Bechtel Jacobs (1998a and 1998b), Sample et al. (1998a and 1998b), and USEPA (2007).

Wildlife toxicity reference values will be primarily selected from the Eco-SSL documents (USEPA, 2008b). Additional literature or technical guidance, such as Sample et al. (1996) and LANL (2017), will be used to supplement the primary sources listed above.

4.2 Sampling and Analysis Plan

The data requirements and proposed Site investigation techniques are documented in the following sections. The proposed activities above will help achieve the objectives of this assessment presented in **Section 4.1**.

4.2.1 Soil Sampling

Subsurface and surface soil samples will be collected as part of the data required for the risk assessments and the Site Assessment. Surface soil is the defined as the top two feet of soil and subsurface soil is two to 10 ft bgs. If ballast material is present, the surface soil horizon will begin at the first layer of soil supporting vegetation (i.e., presence of organic material such as roots).

Subsurface and surface soils will be logged by the field geologist in accordance with the Unified Soils Classification System (USCS), and observations will be recorded in a field book and on soil boring log forms. Soil samples will be visually inspected for signs of staining and discoloration. Field observations will be used to evaluate soil lithology. Field observations will be recorded in the field logbook and later transferred to soil boring logs.

Soil borings be abandoned following soil sampling according to WV Title 47 Code of State Regulations (CSR) Series 60, Section 19 (Monitoring Well Design Standards; Abandonment). Bentonite chips or cement-bentonite slurry will be placed in each borehole to ground level. Any borings installed through concrete or asphalt will be surface sealed with material of the same following borehole abandonment.

4.2.1.1 Surface Soil Sampling

A total of 63 surface soil samples were collected as part of preliminary investigations, however these data were not validated to Stage 4. Therefore, in order to utilize the existing data and meet the data validation requirements of the VRP, additional surface soils will be collected and validated to Stage 4. An additional seven surface soil samples are proposed to meet the 10% data validation criteria.

The proposed surface soil sampling locations were selected to provide data for the northern portion of the site between the last 2011 soil sample (SSIP) and the start of the 2018 samples (SB-1), and at a portion of the previous sampling locations to be used for data validation. Surface soil sampling will be completed at locations accessible to recreational users and

construction/maintenance workers. The proposed locations of the 15 surface soil samples are shown on **Figures 4-1 through 4-4**. The sample IDs, coordinates, sampling depth, proposed analysis, and location rationale is presented in **Table 4-1**.

Sample Collection and Identification

Undisturbed surface soil sampling will be employed primarily using direct push technology (Geoprobe®). In areas of the Site that are less accessible, a manually driven split-spoon sampler for the collection of undisturbed soil samples will be used. Samples will be selected from either the Geoprobe® acetate sample liners or collected from the split-spoon sampler into laboratory-supplied sample containers. Surface soils will be collected in acetate liners and opened immediately upon removal for visual inspection, and a representative portion of soil will be placed in laboratory supplied containers and logged for soil lithology. Multiple soil cores may be required at a given sampling locations for a sample interval in order to provide a sufficient volume of soil for the laboratory analyses. Surface soil samples will be collected at a depth of 0 to 2 ft bgs; as previously indicated, if ballast material is present, the surface soil horizon will begin at the first layer of soil supporting vegetation.

Surface soil samples will be collected from representative sections of the soil core in the order of volatilization (PAHs, metals, and other parameters) and placed in the appropriate certified clean laboratory sample containers. Per WVDEP guidance, naphthalene will be sampled using method 8270D (PAHs) and method 8260B (volatile organic compounds [VOCs]). A summary of the specific analyte groups to be analyzed in surface soil samples at each soil sampling location is provided in **Section 4.2.7**.

Surface soil samples will be labeled with a unique alphanumeric label that will identify the boring ID and depth. The surface soil samples will be identified using the following alphanumeric sequence: SSS-12(0'-2'). The “SSS-12” represents the soil boring ID while the depth is shown in the numeric range shown in parenthesis.

Sample preparation, packaging, and chain-of-custody (CoC) procedures are explained in **Section 4.2.5**. Sample preservation, storage, and holding times are described in **Section 4.2.6**.

4.2.1.2 Subsurface Soil Sampling

To assess exposure for construction/utility workers, 15 subsurface soil samples (below 2 ft bgs or where the surface sample ended) will be collected based on the following rationale:

- The sample will be collected from approximately 4 to 6 ft bgs, which is a depth that both utility workers and construction worker would be exposed to subsurface soil.
- The samples will be collected from locations that are near roads and utility crossings where utility or construction work could occur. Locations will be chosen along the length of the site in order to provide representative data that does not favor areas where elevated concentrations were previously detected in surface soil.

The proposed locations of the 15 surface soil samples are shown on **Figures 4-1 through 4-4**. The sample IDs, coordinates, sampling depth, proposed analysis, and location rationale are presented in **Table 4-1**.

Sample Collection and Identification

Subsurface soil sampling will be employed primarily using direct push technology (Geoprobe®) by a WV-licensed drilling contractor under subcontract to AECOM. Continuous soil cores will be collected using a 1.8-inch diameter by 60-inch long sampler with acetate liner (Geoprobe®) to establish a vertical profile of soil and to define vertical extent. Subsurface soils, which will be collected in acetate liners, will be opened immediately upon removal for visual inspection, and a representative portion of soil will be placed in laboratory supplied containers and logged for soil

lithology. Multiple soil cores may be required at a given sampling locations for a sample interval in order to provide a sufficient volume of soil for the laboratory analyses. Subsurface soil samples will be collected at a depth of approximately 4 to 6 feet bgs.

Subsurface soil samples will be labeled with a unique alphanumeric label that will identify the boring ID and depth. The subsurface soil samples will be identified using the following alphanumeric sequence: SSB-12(2'-8'). The “SSB-12” represents the soil boring ID, while the depth is shown in the numeric range shown in parenthesis.

Sample preparation, packaging, and CoC procedures are explained in **Section 4.2.5**. Sample preservation, storage, and holding times are described in **Section 4.2.6**.

4.2.2 Sediment Sampling

As previously mentioned, sediment samples will be collected from eight culverts along the Site at both upgradient and downgradient locations. Sediment samples will be collected to support the evaluation of potential impacts to downgradient aquatic environments and potential worker exposure during utility or maintenance work. The sample IDs, coordinates, sampling depth, proposed analysis, and location rationale are presented in **Table 4-1**.

4.2.2.1 Sample Collection and Identification

Sediment samples will be collected as part of the data required for risk assessment and the Site Assessment. Samples will be collected within the biologically active zone, which operationally extends from the surface water interface to a depth of approximately 0.5 ft bgs for freshwater sediment (USEPA, 2015). Sediment will be collected in laboratory supplied containers. Samples will be collected in the order of volatilization (i.e. PAHs, metals, and other parameters).

Sediment samples will be labeled with a unique alphanumeric label that will identify the boring ID and depth. The sediment samples will be identified using the following alphanumeric sequence: SED-1-U(0'-0.5'). The “SED-1-U” represents the boring ID, while the depth is shown in the numeric range shown in parenthesis. Within the boring ID “U” refers to the upgradient culvert location and “D” refers to the downgradient culvert location.

Sample preparation, packaging, and CoC procedures are explained in **Section 4.2.5**. Sample preservation, storage, and holding times are described in **Section 4.2.6**.

4.2.3 Surface to Groundwater Migration Sampling

At each upgradient sediment sample, a co-located SPLP sample will be collected to evaluate the potential for surface to groundwater migration of Site-related COPCs. At select surface soil locations SPLP analysis will be performed. In addition to addressing the utility and construction worker exposure (i.e., groundwater within trench), these samples will allow a more direct exposure point to evaluate benthic invertebrates within the HZ.

Further discussions on the details of surface to groundwater migration assessment are discussed in the sections below. The sample IDs, coordinates, sampling depth, proposed analysis, and location rationale is presented in **Table 4-1**.

4.2.3.1 Sample Collection and Identification

SPLP samples will be collected using the same procedures as sediment (laboratory will extract water from the sediment) or surface soil, respectively. SPLP sediment samples will be labeled with a unique alphanumeric label that will identify the Site. SPLP sediment samples will be identified using the following alphanumeric sequence: SPLP-2(0’-0.5’). The “SPLP” identifies the sample source. The number (i.e.”2”) refers to the co-located, upgradient sediment sample ID while the depth is shown in the numeric range shown in parenthesis. Duplicate and equipment

blanks will have unique identifiers that will be able to be distinguished from the normal sample label scheme.

Sample preparation, packaging, and CoC procedures are explained in **Section 4.2.5**. Sample preservation, storage, and holding times are described in **Section 4.2.6**.

4.2.4 Field Quality Assurance/Quality Control Samples

Three types of Quality Assurance/Quality Control (QA/QC) samples will be acquired. Field duplicates, field blanks, and equipment blank will be collected in the field during sampling activities, and trip blanks will be prepared in the laboratory and accompany the sample bottles to and from the laboratory. The planned QA/QC samples for the event are described in **Section 4.5.1**. Because new tubing is used in each well during each sampling event, no equipment is transferred between wells; thus, no equipment blanks are needed for groundwater sampling.

4.2.5 Sample Preparation, Packaging, and Chain of Custody Procedures

Bottleware for the samples will be acquired from the laboratory. As each sample is collected/selected, the following information should be included on each label for the bottleware using indelible ink:

1. Project name;
2. Sample identification
3. Date of sampling;
4. Time of sample collection;
5. Analyses to be performed (be as specific as possible);
6. Whether filtered or unfiltered (water sample only);
7. Preservatives;
8. The number of containers for the sample (1 of 2, 2 of 2);
9. Sample matrix (i.e., soil, water, sediment, etc.); and
10. The initials of the field sampling personnel.

When the label is applied to the sample container, it will be covered with clear tape, ensuring that the tape completely encircles the container. Each sample's identification and other information will be transferred to the CoC. At the end of the field day, all samples labels will be checked to ensure they are written clearly and legibly, the bottles will be packed carefully with adequate protection and ice in a sealed cooler, and the cooler will be accompanied by an enclosed, completed CoC form provided by the laboratory.

4.2.6 Sample Preservation, Storage, and Holding Times

Samples must be stored on ice and reach the laboratory before their holding times expire. Samples will typically be shipped daily, although they may occasionally be held for a day or two, as long as temperature and chain of custody requirements are satisfied. Details on preservatives, storage, and holding times are summarized in **Table 4-2.**

4.2.7 Laboratory and Analytical Methods

Pace Analytical Laboratories of Beaver, WV will provide analytical services for the Supplemental Site Assessment for all samples, except SPLP, which will be analyzed at Pace Analytical Laboratories of Pittsburgh, Pennsylvania (PA). The address for the Pace Analytical Hurricane Laboratory is as follows: Pace Analytical Laboratories, Inc.; 225 Industrial Park Rd; Beaver, WV

25813. The address for the Pace Analytical Pittsburgh Laboratory is as follows: Pace Analytical Services LLC – Pittsburgh, PA; 1638 Roseytown Suites 2, 3, & 4, Greensburg, PA, 15601.

Both laboratories are National Environmental Laboratory Accreditation Program (NELAP)-accredited. Pace Analytical Laboratories of Beaver, WV has been certified by the WVDEP, Division of Water and Waste Management (WVDEP Certification No. 060). Pace Analytical Laboratories of Pittsburgh, PA has been certified by the PA Department of Environmental Protection (PADEP), Bureau of Laboratories (PADEP Certification No. 020). The Pace Analytical Laboratories Quality Assurance Manual is included in **Appendix C**.

Based on the identified historical use of the site as a railroad, surface and subsurface soil, sediment, and SPLP samples will be analyzed by USEPA approved methods for the following target analyte groups:

- PAHs (USEPA Method 8270C)
- Naphthalene only (USEPA Method 8260B)
- Arsenic and Lead (USEPA Method 6010/7470)

The anticipated analytical method limits and screening criteria for soil and sediment are summarized in **Table 4-3**. The specific compounds within each target analyte group for the sampling analysis for each media are provided on **Table 4-4**.

4.2.8 Decontamination Procedures

Decontamination of equipment and tools is necessary and important for the accurate analysis of samples that represent the conditions at the locations from which they are collected. Proper decontamination also ensures that constituents are not dispersing beyond the source area. The sampling field team will ensure boots are decontaminated and will wear new nitrile gloves for collection of each sample. For soil, sediment, and surface water sampling, reusable equipment will be decontaminated with detergent solution and water and dried with paper towels. Reusable equipment will be decontaminated before use, between each sample, and at the end of the field event. After measuring the groundwater level in each well, the interface probe will be decontaminated by rinsing the probe tape with detergent solution and water and wiping with paper towels. The peristaltic pump tubing is also for one-time use and will be discarded (not decontaminated) at the end of sampling, and new tubing will be used for the next well.

4.3 Management of Program-Derived Waste

Waste materials that are generated through the completion of the investigative activities will be segregated based on type of waste and managed accordingly. Waste materials that will be generated from the investigations include, but are not necessarily limited to, the following:

- Soil cuttings;
- Excess soil samples;
- Monitoring well development and purge water;
- Acetate liners with residual soil;
- Decontamination fluids from sampling equipment;
- Spent personal protective equipment (PPE);
- Plastic sheeting (decontamination pads);
- Dedicated tubing from sampling pumps;
- Packaging materials.

Investigative derived wastes (IDW) will be segregated and placed into Department of Transportation (DOT) and UN approved steel 55-gallon drums. Each drum will be labeled to indicate contents, generator name, address, contact, and date of generation. All drums will be transported back to the Preston Site pending proper characterization and disposal through the Capital Environmental.

All efforts will be made to restrict the amount of IDW generated during field activities such as using the less intrusive investigation techniques (i.e. Geoprobe®) when possible instead of hollow-stem augur.

Additionally, field observations will be used to further segregate waste types to more accurately manage potentially hazardous waste from non-hazardous waste (i.e. segregate impacted soil from non-impacted soil).

The IDW will be characterized prior to a disposal option to determine the classification of the waste stream (i.e. hazardous versus non-hazardous). The IDW will be characterized by composite sampling that represents the waste materials. Should some materials be more impacted than others and have been segregated in that manner, then the segregated IDW will be sampled accordingly.

IDW will be characterized using Resource Conservation and Recovery Act methods from SW-846. Soils will be characterized by toxicity characteristic leaching procedure for VOCs, SVOCs, and metals. Water/liquid will be analyzed for VOC, SVOC, PCB and total metals.

4.4 Health, Safety, and Security

All work conducted for this investigation will be performed in accordance with the Health and Safety Plan (HASP) developed for the site and applicable AECOM Safety Management Standards. All on-site personnel shall be trained in accordance with 20 CFR 1910.120 requirements for hazardous waste site operations and will attend a pre-work safety briefing. Drilling, sampling, and other field activities conducted commence in Level D personal protective equipment (PPE). PPE used will include at a minimum, safety glasses or goggles, hard hat (if overhead hazards are present such as drilling with mast raised), steel-toed boots, and hearing protection (as required). PPE will be upgraded as necessary in accordance with the HASP guidelines.

Subcontractor personnel shall have 40 hours of Occupational Safety and Health Administration's (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) certification with current refresher training. All HAZWOPER and other required certificates for subcontractors and AECOM personnel will be kept in the project file at AECOM office in Kenova, West Virginia. A courtesy copy of the HASP will be provided to the subcontractors prior to the start of activities. A copy of the site-specific HASP for this project is included in **Appendix D**.

4.5 Quality Assurance

QA/QC samples will be collected during the field investigations and include the following:

- Matrix Spike/Matrix Spike Duplicates (MS/MSD);
- Equipment blanks;
- Trip blanks; and
- Duplicate samples.

Further information on the QA/QC samples is discussed in the sections below.

4.5.1 Laboratory Instrument/Equipment Testing, Inspection, Maintenance, Calibration, and Frequency

All instrument and equipment testing, inspection, and maintenance will be performed per the applicable analytical method and/or laboratory standard operating procedures (SOP) and will be conducted by laboratory personnel. The Pace Analytical Laboratory Quality Assurance Manual is attached as **Appendix C**.

Laboratory instrumentation calibration procedures, frequency, and standards will be consistent with the requirements of the applicable analytical method. An instrument calibration establishes a reproducible reference point to which all sample measurements can be correlated. The analytical method mandates the frequency of instrument calibrations. Laboratory calibration standards will be traceable to their sources. Routine calibrations are required for most forms of analytical instrumentation. An initial calibration is performed before sample analysis. Where appropriate, retention time windows will be established for each compound of interest. Calibrations will be verified by using independent standards as a QC check sample, calibration verification samples, and fully processed laboratory control spikes (LCS).

For quantitative analyses, a continuing calibration check (midpoint calibration standard) will be analyzed every 12 hours according to the analytical method.

4.5.2 Field Instrument/Equipment Calibration and Frequency

Field measuring and test equipment will be calibrated in accordance with manufacturer's instructions. The field sampling team will inspect equipment during calibration to evaluate the physical condition of the equipment. The purpose of the inspection is to detect any abnormal wear or damage that may affect the operation of the equipment before the next calibration. Equipment found to be out of calibration or in need of maintenance or repair will be identified and removed from service.

The field sampling team will retain calibration records that accompany the rental equipment for each measurement item and test equipment. If the rental equipment appears to be out of calibration, the field team will exchange it for another properly calibrated piece of equipment.

4.5.3 Non-direct Measurements

Field observations, such as odor, will be recorded in the field logbook. Observations made by laboratory personnel may be recorded on the CoC form or documented in the case narrative.

4.5.4 Special Training/Certification

The analytical laboratory Pace Analytical Laboratories of Beaver, WV holds accreditation through the NELAP and the State of West Virginia (WVDEP Certification No. 060) for all parameters in the scope of this project. The analytical laboratory Pace Analytical Laboratories of Pittsburgh, PA holds accreditation through the NELAP and the State of West Virginia (WVDEP Certification No. 143) for all parameters in the scope of this project.

Field sampling teams are trained in soil, sediment, and SPLP sampling methodologies, have completed the OSHA 40-hour HAZWOPER course with current 8-hour refresher training, and comply with the health and safety training requirements of AECOM. Additional health and safety information appears in the site-specific Health and Safety Plan.

4.5.5 Data Generation and Acquisition

This section discusses procedures specific to sample handling/custody and subsequent data management. Sampling methods are summarized in **Section 4.2**.

4.5.5.1 Sampling Handling and Custody

This section provides additional information on sample custody from a quality perspective. During the field investigation, sample custody has three phases. The first phase encompasses sample collection, pre-laboratory treatment procedures (preservation), packaging, and shipping field custody procedures. All samples will be packaged using bubble wrap to avoid breakage.

Field personnel will be aware at all times of the need to maintain all samples, whether in the field or in the laboratory, under strict CoC. A sample is in the custody of a person if it is in their possession, within their view, or secured by them in a location accessible only to authorized personnel.

The second custody phase involves sample shipment, where mode of shipment, air bill numbers, dates, and times are documented. The third phase involves the custody procedures employed by the laboratory. Samples are received in the laboratory under CoC and are considered to be in a secure location while within the confines of the laboratory. Laboratory facilities are locked whenever personnel are not present. Laboratory custody is terminated by laboratory staff filing manifests and/or shipping documents upon clean disposal. The temperature is measured from a temperature blank from each cooler as soon as possible after receipt and recorded into a logbook. The Quality Coordinator or Project Chemist will be notified immediately of any problems observed with the previous day's shipment (e.g., breakage, inconsistencies with CoC, actual numbers received, or coolers that fail to meet temperature criteria of <6 degrees Celsius [°C]). All three phases of sample custody will be performed to ensure that:

- All samples are uniquely identified;
- The correct samples are tested and are traceable to their source;
- Important sample characteristics are preserved;
- Samples are protected from loss, damage, or temperature extremes; and
- A record of sample integrity is established and maintained through the entire custody process.

4.5.5.2 Data Management

Bound logbooks will be used for all record-keeping purposes in both the field and laboratory except for certain standard forms that will be maintained in three-ring binders. All logbooks and binders will contain a unique document control number. All pages, including loose-leaf forms, will be numbered.

Field and laboratory personnel will transmit the bound logbooks to the field team leader or Laboratory Quality Manager (or their designees) on a routine basis. Logbooks will be reviewed at the end of each sampling event by the field team leader or Laboratory Quality Manager.

To ease data review, the person making an entry must sign and date the entry. All entries must be recorded in permanent ink. Correction to entries will be made by drawing a line through the incorrect entry, recording the correct information, and initialing and dating the corrected entry. If the reason for making the change is not immediately evident, an explanation is required. Unused portions of logbook pages must be lined out.

If computerized information is used, a hard copy that has been permanently affixed to the logbook will be acceptable as an original record of sampling and/or laboratory logging.

4.5.6 Data Validation and Usability

Validation of objective field and technical data will be performed at two different levels – Field and Technical Data Validation and Laboratory Data Review.

The first level of data validation will be performed at the time of collection by following standard procedures and QC checks. The Project Manager will review the data to ensure that the correct codes and units have been included to complete the second level of data validation. After data reduction into tables and arrays is complete, the Project Manager will review data sets for anomalous values. The Project Manager, who will review field reports for reasonableness and completeness, will validate subjective field and technical data.

The laboratory will review data prior to its release from the laboratory. The analytical method performance will be determined by the laboratory by an examination of precision, accuracy, and completeness, as well as a review of the following QC measures:

- Method Blanks: Measure of laboratory contamination and accuracy;
- Laboratory Duplicates: Measure of laboratory precision;
- Field Duplicates: Measure of field sampling and laboratory precision;
- Matrix Spikes: Measure of laboratory accuracy and any sample matrix effects;
- Surrogate Spike Recoveries: Measure of laboratory accuracy; and
- Laboratory Control Samples: Measure of laboratory accuracy

Outlying data will be flagged in accordance with the laboratory SOPs, and corrective action will be taken to rectify the problem. The laboratory case narratives will describe how the data did or did not meet the method criteria.

Ten percent of the analytical data that will be used to develop EPCs for the risk assessment will be validated to Stage 4. The data validation will be performed to meet the M-3/IM-2 level of review according to Inorganic/Organic Level 2 (equivalent to an USEPA Stage 4 validation) protocols following *USEPA National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, 2017) and the *USEPA National Functional Guidelines for Superfund Inorganic Methods Data Review* (USEPA, 2017), with the exception of the USEPA Region III provision to use “B” qualifier for blank detections.

4.5.7 Data Quality Objectives

The Data Quality Objectives (DQOs) are assessed by evaluating Precision, Accuracy, Representatives, Completeness, Comparability, and Sensitivity (PARCCS). PARCCS are presented below and the DQOs for each are evaluated.

Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed conditions. Assessing precision measures the random error component of the data collection process. Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions, and is calculated as an absolute value. The degree of agreement, expressed as the relative percent difference (RPD), is calculated using the formula below.

$$RPD = \left\{ \frac{\left| X_1 - X_2 \right|}{\left[(X_1 + X_2)/2 \right]} \right\} x \quad 100\%$$

$$RSD = \left(\frac{\left[std\ \ dev \right]}{\overline{X}} \right) x\, 100\%$$

$$[std\ dev] = \sqrt{\left[\sum \frac{\left(X_i - \overline{X}\right)^2}{(n-1)}\right]}$$

Analytical precision is assessed by analyzing MS pairs and laboratory duplicate samples. Laboratory precision control limits and RPD limits are presented in **Table 4-3.** Field precision is assessed by measurement of field duplicate samples. The precision goal for positive parent and field duplicate results is a relative percent difference less than 35 percent. When only one of the pair is positive for a particular analyte, the precision goal will be less than two times the Practical Quantitation Limit (PQL). The objective for precision is to equal or exceed the precision demonstrated for similar samples and should be within the established control limits for the methods.

Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Accuracy measures the bias or systematic error of the entire data collection process. Sources of these errors include the sampling process, field and laboratory contamination, sample preservation and handling, sample matrix interferences, sample preparation methods, and calibration and analytical procedures. To determine accuracy, a reference material of known concentration is analyzed or a sample which has been spiked with a known concentration is reanalyzed. Accuracy is expressed as a percent recovery and is calculated using the following formula:

$$ACCURACY = \frac{MEASUREDVALUE}{KNOWNVALUE} \text{ x } 100$$

Recoveries are assessed to determine method efficiency and matrix interference effects.

Analytical accuracy is measured by the analysis of calibration checks, system blanks, QC samples, surrogate spikes, MSs, and other checks required by the selected analytical methods. Sampling accuracy is assessed by evaluating the results of field and trip blanks. Sampling accuracy is also maintained by frequent and thorough review of field procedures. The objective is to meet or exceed the demonstrated accuracy for the analytical methods on similar samples and should be within established control limits for the methods. Accuracy control limits and MS/MSD and surrogate recovery limits are presented in **Table 4-3**.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is achieved through proper development of the field sampling program. The sampling program must be designed so that the samples collected are as representative as possible of the medium being sampled and that a sufficient number of samples will be collected. The objective of obtaining representativeness of samples will be met through the implementation of this Work Plan.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Data are complete and valid if they meet all acceptance criteria, including accuracy, precision, and any other criteria specified by the particular analytical method being used. Completeness is calculated as follows:

$$COMPLETENESS = \frac{QUANTITY\ OF\ RELIABLE\ DATA}{TOTAL\ QUANTITY\ OF\ DATA} \times 100$$

The objective is to generate a sufficient database with which to make informed decisions.

To help meet the completeness objective, every effort must be made to avoid sample loss through accidents or inadvertence. The completeness objective for this project is 90 percent.

The laboratory will provide a full deliverable, including raw data for all sample delivery packages. Electronic data deliverables (EDDs) are required. Electronic deliverables will be transmitted with the final data package for each sampling event via email. The data will be provided in an ASCII, tab delimited file containing the information for all field samples and laboratory QC samples. The first row of data will contain the field names in the order that they appear in the data file. All rows/records following the header row will contain data for each of the data fields and there will be no blank rows.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability cannot be described in quantitative terms, but must be considered in designing the sampling program. Thus, this objective will be met by using standard methods for sampling and analyses and by following techniques and methods set forth in this Work Plan.

Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between small differences in analyte concentration. The laboratory will report all detections greater than the Method Detection Limit (MDL). Non-detections will be reported at the PQL. In the circumstance where the PQL for a non-detect result exceeds the comparison criteria, this will be evidence of no contamination.

4.6 Reporting

The Supplemental Site Assessment Report will include a summary of previous investigations, the results of the additional sampling, an updated CSM, if required, and recommendations for additional assessment if warranted. Figures will include Site location and sample locations maps along with data tables summarizing analytical results. Data will be initially screened against De Minimus screening levels and preliminary recreational user values based on camping exposure factors in the 2020 VRP guidance document. Organization of the HHRA and ERA are presented in the subsections below.

4.6.1 Human Health Risk Assessment

The HHRA will be prepared pursuant to the requirements of the WVDEP VRP, addressing the site-specific risk assessment requirements as presented in Voluntary Remediation and Redevelopment Rule (W. Va. Legislative Rule 60CSR3). The HHRA will also follow the USEPA “Risk Assessment Guidance for Superfund (RAGS)” Part A (1989) and subsequent RAGS guidance, which stipulates that a risk assessment addresses the following major steps:

- Data Evaluation: A description of the data handling of each exposure medium and the exposure areas evaluated in the HHRA.
- Identification of COPCs: An identification of the COPCs for each exposure medium regarding human health effects.
- Exposure Assessment: An identification of the human receptors and the potential extent of their exposure to Site-related COPCs in affected media.

- Toxicity Assessment: A description of the relationship between the magnitude of exposure (intake, dermally absorbed dose, or exposure concentration) and the incidence of adverse health effects associated with the identified COPCs.
- Risk Characterization: A description of the nature and magnitude of potential human health risks, comparison to state and federal target risk levels, and discussion of the uncertainties associated with the risk evaluation.

The HHRA will be included as an appendix to the Supplemental Site Assessment Report.

4.6.2 Ecological Risk Assessment

The ERA will be included as an appendix to the Supplemental Site Assessment Report following the SSS outlined within the WVDEP *Voluntary Remedial Program – Guidance Manual (June 2020)*. The general structure of the ERA Report will follow Step 1 and 2 of USEPA (1997)'s *Ecological Risk Assessment Guidance for Superfund* (ERAGS) with refinements to the baseline risk assessment made following Step 3a of USEPA (1997 and 2001) and supplemented by USEPA Region 4's *Ecological Risk Assessment Supplemental Guidance* (USEPA, 2018). Any modifications outlined in Section 4.10 of WVDEP (2020) will be incorporated into the general USEPA "ERAGS" approach. The proposed Site-Specific Standard ERA Report will inherently include the preliminary steps associated with the De Minimis Ecological Screening Evaluation (WVDEP, 2020).

The intended outline of the ERA Report is documented below:

1. Introduction
2. Step 1: Screening Level Problem Formulation and Ecological Effects Evaluation
    a. Ecological Setting and Potential Habitats
    b. Potential Ecological Receptors
    c. Potential Source Areas and Constituents of Interest
    d. Identification and Evaluation of Migration Pathways
    e. Fate and Transport Characteristics
    f. Ecotoxicological Properties
    g. Exposure Routes and Receptors Not Evaluated
    h. Receptors of Concern and Exposure Routes Selected for Evaluation
    i. Management Goals with Assessment and Measurement Endpoints
    j. Ecological Screening Benchmarks
3. Step 2: Screening Level Exposure Estimate and Risk Calculation
    a. Exposure Areas
    b. Data Used to Characterize Ecological Exposure
    c. Screening Level Exposure Estimate
    d. Screening Level Risk Calculations and Risk Characterization
    e. Scientific Management Decision Point
4. Step 3a: Constituents of Potential Ecological Concern (COPEC) Refinement
    a. Step 3a COPEC Refinement Approach
    b. Refined Risk Calculations and Risk Characterization

c. Step 3a COPEC Refinement Summary

5. Uncertainty Assessment
6. Conclusions and Recommendations
7. References

4.6.3 Recipients

The Supplemental Site Assessment Report will be prepared on behalf of FOC. Following the Voluntary Remediation Agreement between FOC and the WVDEP, copies of this report and associated correspondence will be submitted to by electronic mail to WVDEP at DEPOERFileCopy@wv.gov with a copy to the OER Project Manager.

4.7 Schedule

The anticipated schedule for implementing this Supplemental Site Assessment Plan is summarized below and will be adjusted as necessary, depending on access, subcontractor availability, weather and safety conditions, and laboratory analytical results.

Document/Work	Date
Supplimental Site Assessment Site Walk	Completed 10/09/20
Supplimental Site Assessment Sampling	30 days after Supplemental Site Assessment Work Plan approval
Supplimental Site Assessment Report	90 days after Supplemental Site Assessment Work Plan approval

Table 4-1: Proposed Sample Location Information

Location ID	Sample ID	Matrix	Coordinates		Closest Station	Depth (ft)	Proposed Analysis	Grab or Composite	Location Rationale	CSM Potential Receptor Exposed							
										Ecological				Human Health			
			Latitude	Longitude						Soil Invert.	Terr. Wildlife	Benthic Invert.	Aqua. Wildlife	REC	OW	CW	UW
SSS-1	SSS-1(0'-2')	Surface Soil	39°21'19.7"N	79°41'15.8"W	None	0-2	As, Pb, PAHs	Grab	West of Manhiem and south of the site	●	●			●	●	●	●
SSB-1	SSB-1(2'-8')	Subsurface Soil	39°21'19.7"N	79°41'15.8"W	None	2-8	As, Pb, PAHs	Grab	West of Manhiem and south of the site							●	●
SSS-2	SSS-2(0'-2')	Surface Soil	39°22'15.9"N	79°41'54.0"W	165	0-2	As, Pb, PAHs, SPLP	Grab	By culvert C002	●	●			●	●	●	●
SSB-2	SSB-2(2'-8')	Subsurface Soil	39°22'15.9"N	79°41'54.0"W	165	2-8	As, Pb, PAHs	Grab	By culvert C002							●	●
SSS-3	SSS-3(0'-2')	Surface Soil	39°22'45.3"N	79°42'18.0"W	200	0-2	As, Pb, PAHs	Grab	By culvert C008	●	●			●	●	●	●
SSB-3	SSB-3(2'-8')	Subsurface Soil	39°22'45.3"N	79°42'18.0"W	200	2-8	As, Pb, PAHs	Grab	By culvert C008							●	●
SSS-4	SSS-4(0'-2')	Surface Soil	39°23'20.3"N	79°41'59.7"W	245	0-2	As, Pb, PAHs	Grab	By culvert C014	●	●			●	●	●	●
SSB-4	SSB-4(2'-8')	Subsurface Soil	39°23'20.3"N	79°41'59.7"W	245	2-8	As, Pb, PAHs	Grab	By culvert C014							●	●
SSS-5	SSS-5(0'-2')	Surface Soil	39°23'49.8"N	79°41'37.7"W	290	0-2	As, Pb, PAHs, SPLP	Grab	By Bear Wallow Run and Bridge #42A	●	●			●	●	●	●
SSB-5	SSB-5(2'-8')	Subsurface Soil	39°23'49.8"N	79°41'37.7"W	290	2-8	As, Pb, PAHs	Grab	By Bear Wallow Run and Bridge #42A							●	●
SSS-6	SSS-6(0'-2')	Surface Soil	39°24'09.5"N	79°40'46.0"W	340	0-2	As, Pb, PAHs	Grab	By unnamed stream and Bridge #41B	●	●			●	●	●	●
SSB-6	SSB-6(2'-8')	Subsurface Soil	39°24'09.5"N	79°40'46.0"W	340	2-8	As, Pb, PAHs	Grab	By unnamed stream and Bridge #41B							●	●
SSS-7	SSS-7(0'-2')	Surface Soil	39°24'32.1"N	79°41'04.5"W	370	0-2	As, Pb, PAHs	Grab	By culvert C034	●	●			●	●	●	●
SSB-7	SSB-7(2'-8')	Subsurface Soil	39°24'32.1"N	79°41'04.5"W	370	2-8	As, Pb, PAHs	Grab	By culvert C034							●	●
SSS-8	SSS-8(0'-2')	Surface Soil	39°25'00.9"N	79°41'10.8"W	400	0-2	As, Pb, PAHs, SPLP	Grab	By culvert C040	●	●			●	●	●	●
SSB-8	SSB-8(2'-8')	Subsurface Soil	39°25'00.9"N	79°41'10.8"W	400	2-8	As, Pb, PAHs	Grab	By culvert C040							●	●
SSS-9	SSS-9(0'-2')	Surface Soil	39°25'27.9"N	79°41'07.4"W	430	0-2	As, Pb, PAHs	Grab	By Whetsell Run and bridge #39C	●	●			●	●	●	●
SSB-9	SSB-9(2'-8')	Subsurface Soil	39°25'27.9"N	79°41'07.4"W	430	2-8	As, Pb, PAHs	Grab	By Whetsell Run and bridge #39C							●	●
SSS-10	SSS-10(0'-2')	Surface Soil	39°26'01.6"N	79°41'02.7"W	465	0-2	As, Pb, PAHs, SPLP	Grab	By highest As detection	●	●			●	●	●	●
SSB-10	SSB-10(2'-8')	Subsurface Soil	39°26'01.6"N	79°41'02.7"W	465	2-8	As, Pb, PAHs	Grab	By highest As detection							●	●
SSS-11	SSS-11(0'-2')	Surface Soil	39°26'31.5"N	79°40'56.9"W	495	0-2	As, Pb, PAHs	Grab	By culvert C05	●	●			●	●	●	●
SSB-11	SSB-11(2'-8')	Subsurface Soil	39°26'31.5"N	79°40'56.9"W	495	2-8	As, Pb, PAHs	Grab	By culvert C05							●	●
SSS-12	SSS-12(0'-2')	Surface Soil	39°27'00.1"N	79°40'33.4"W	530	0-2	As, Pb, PAHs, SPLP	Grab	By culvert C056	●	●			●	●	●	●
SSB-12	SSB-12(2'-8')	Subsurface Soil	39°27'00.1"N	79°40'33.4"W	530	2-8	As, Pb, PAHs	Grab	By culvert C056							●	●
SSS-13	SSS-13(0'-2')	Surface Soil	39°27'11.8"N	79°40'22.0"W	545	0-2	As, Pb, PAHs	Grab	By culvert C058	●	●			●	●	●	●
SSB-13	SSB-13(2'-8')	Subsurface Soil	39°27'11.8"N	79°40'22.0"W	545	2-8	As, Pb, PAHs	Grab	By culvert C058							●	●
SSS-14	SSS-14(0'-2')	Surface Soil	39°27'20.7"N	79°40'13.2"W	555	0-2	As, Pb, PAHs	Grab	By culvert C060	●	●			●	●	●	●
SSB-14	SSB-14(2'-8')	Subsurface Soil	39°27'20.7"N	79°40'13.2"W	555	2-8	As, Pb, PAHs	Grab	By culvert C060							●	●
SSS-15	SSS-15(0'-2')	Surface Soil	39°27'30.3"N	79°39'54.1"W	575	0-2	As, Pb, PAHs	Grab	By culvert C064	●	●			●	●	●	●
SSB-15	SSB-15(2'-8')	Subsurface Soil	39°27'30.3"N	79°39'54.1"W	575	2-8	As, Pb, PAHs	Grab	By culvert C064							●	●
SED-1-U	SED-1-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-1-D	SED-1-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-2-U	SED-2-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-2-D	SED-2-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●

Table 4-1: Proposed Sample Location Information (continued)

Location ID	Sample ID	Matrix	Coordinates		Closest Station	Depth (ft)	Proposed Analysis	Grab or Composite	Location Rationale	CSM Potential Receptor Exposed							
										Ecological				Human Health			
			Latitude	Longitude						Soil Invert.	Terr. Wildlife	Benthic Invert.	Aqua. Wildlife	REC	OW	CW	UW
SED-3-U	SED-3-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-3-D	SED-3-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-4-U	SED-4-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-4-D	SED-4-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-5-U	SED-5-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-5-D	SED-5-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-6-U	SED-6-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-6-D	SED-6-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-7-U	SED-7-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-7-D	SED-7-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-8-U	SED-8-U(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SED-8-D	SED-8-D(0'-0.5')	Sediment				0-0.5	As, Pb, PAHs	Grab				●	●	●	●	●	●
SPLP-1	SPLP-1(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-2	SPLP-2(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-3	SPLP-3(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-4	SPLP-4(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-5	SPLP-5(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-6	SPLP-6(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-7	SPLP-7(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●
SPLP-8	SPLP-8(0'-0.5')	Sediment/Water				0-0.5	As, Pb, PAHs	Grab				●	●			●	●

Notes:

Aqua. = Aquatic
As = Arsenic
CW = Construction Worker
ft = feet
Invert. = Invertebrate
OW = Outdoor Worker
N/A = Not Applicable
PAH = Polycyclic Aromatic Hydrocarbon
Pb = Lead
REC = Recreator
SPLP = Synthetic Precipitation Leachate Procedure
UW = Utility Worker

Table 4-2: Sample Containers, Preservation Methods, and Holding Times

Analyte/ Analyte Group	Preparation/ Analytical Method/ SOP	Container(s) (number, size, and type per sample)	Preservation	Analytical Holding Time
Metals (arsenic and lead)	EPA Method 200.8 EPA Method 3050B (prep) EPA Method 6010C (analytical)	Aqueous: BP3N container; 250 mL Plastic	Thermal: None Chemical: HNO3 to pH < 2	Collection to Analysis: 180 days
		Solid: WGKU; 8 oz glass jar	Thermal: ≤ 6°C; not frozen Chemical: None	Collection to Analysis: 180 days
PAHs	EPA Method 8270D (analytical) EPA Method 3510C (prep)	Aqueous: 1-liter Amber Glass; 1000 mL	N/A	Collection to Analysis: 7 days, then 40 days once extracted
		Solid: 9 oz Glass Jar; 25 g	N/A	Collection to Analysis: 14 days, then 40 days once extracted
Naphthalene	EPA Method 8260B (analytical) EPA Method 5035C (prep)	Aqueous: 40mL Vial; 3 x 40mL	HCL	Collection to Analysis: 14 days
		Solid: 40mL Vial; 4 x 40mL	Sodium Bisulfate & Methanol	Collection to Analysis: 14 days

SOP = Standard Operating Procedure
mL = milliliter
ºC – degree Celsius
Note: SPLP extraction will not require additional containers or different preservation methods.

Table 4-3: Analytical Method Limits and Screening Criteria for Soil and Sediment

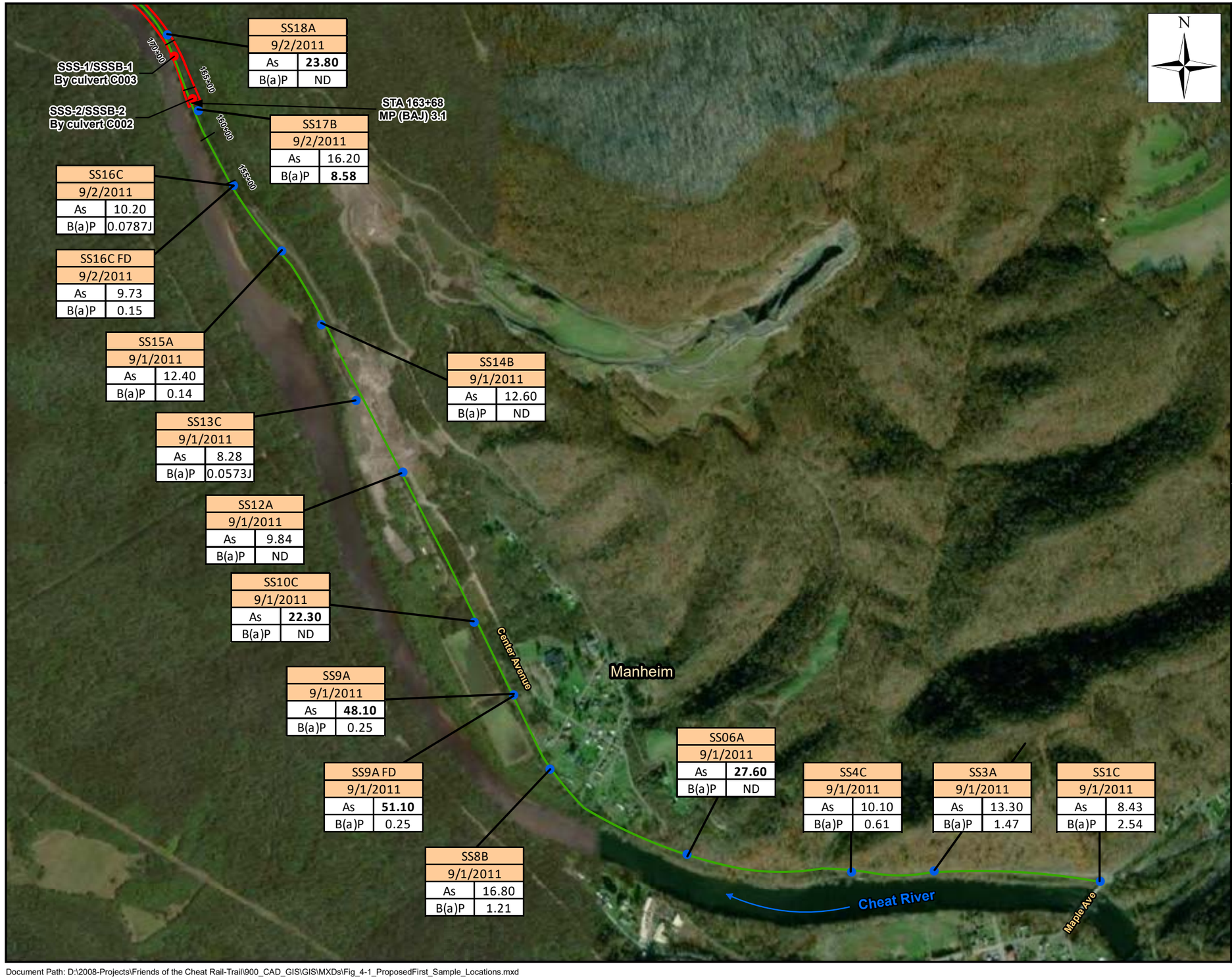
Method	Analyte	Screening Criteria (1) (mg/kg)	Matrix Spike Recovery Limits (%)	Laboratory Control Spike Recovery Limits (%)	Practical Quantitation Limit (mg/kg)	Method Detection Limit (mg/kg)
Metals (USEPA Method 6010)	Arsenic	0.43	75-125	80-120	5	0.59
	Lead	400	75-125	80-120	5	0.55
PAHs (USEPA Method 8270 SIM)	Anthracene	23000	25-132	25-132	0.0033	0.000559
	Acenaphthene	4100	20-120	20-120	0.0033	0.00091
	Acenaphthylene	4200	28-114	28-114	0.0033	0.00165
	Benzo(a)anthracene	0.21	13-160	13-160	0.0033	0.000511
	Benzo(a)pyrene	0.016	14-125	14-125	0.0033	0.000398
	Benzo(b)fluoranthene	0.16	13-141	13-141	0.0033	0.000561
	Benzo(g,h,i)perylene	1800	23-121	23-121	0.0033	0.000789
	Benzo(k)fluoranthene	1.6	6-155	6-155	0.0033	0.000562
	Chrysene	16	21-129	21-129	0.0033	0.000511
	Dibenzo(a,h)anthracene	0.016	19-138	19-138	0.0033	0.000856
	Fluoranthene	2400	15-136	15-136	0.0033	0.000392
	Fluorene	2900	19-128	19-128	0.0033	0.000822
	Indeno(1,2,3-cd)pyrene	0.16	30-123	30-123	0.0033	0.000602
	Phenanthrene	4.1	16-131	16-131	0.0033	0.000727
	Pyrene	23000	9-147	9-147	0.0033	0.000722
	Naphthalene	4.1	18-144	18-144	0.0033	0.000392
USEPA 8260B	Naphthalene	4.1	70-130	70-130	0.004	0.00164

(1) WV DEP De Minimis screening levels for residential soil (June 2020)

Table 4-4: Specific Compounds for Proposed Samples

Sample Location	SSS-1 through SSS-15	SSB-1 through SSB-15	SED-1-U/D through SED-8-U/D	SPLP-1 through SPLP-8	
Sample Type	Surface Soil	Subsurface Soil	Sediment	Dissolved Water (via Sediment)	Total Water (via Sediment)
Parameter					
Metals (USEPA Method 6010/7470)					
Arsenic	X	X	X	X	X
Lead	X	X	X	X	X
VOC (USEPA Method 8260)					
Naphthalene	X	X	X	X	X
SVOC (USEPA Method 8270C)					
Anthracene	X	X	X	X	X
Acenaphthene	X	X	X	X	X
Acenaphthylene	X	X	X	X	X
Benzo(a)anthracene	X	X	X	X	X
Benzo(a)pyrene	X	X	X	X	X
Benzo(b)fluoranthene	X	X	X	X	X
Benzo(g,h,i)perylene	X	X	X	X	X
Benzo(k)fluoranthene	X	X	X	X	X
Chrysene	X	X	X	X	X
Dibenzo(a,h)anthracene	X	X	X	X	X
Fluoranthene	X	X	X	X	X
Fluorene	X	X	X	X	X
Indeno(1,2,3-cd)pyrene	X	X	X	X	X
Naphthalene	X	X	X	X	X
Phenanthrene	X	X	X	X	X
Pyrene	X	X	X	X	X
Synthetic Precipitation Leaching Procedure (SPLP)					
SPLP of the above parameters	SSS-2,5,8,10, and 12 only	'--	'--	X	X

Match Line - See Figure 2-3



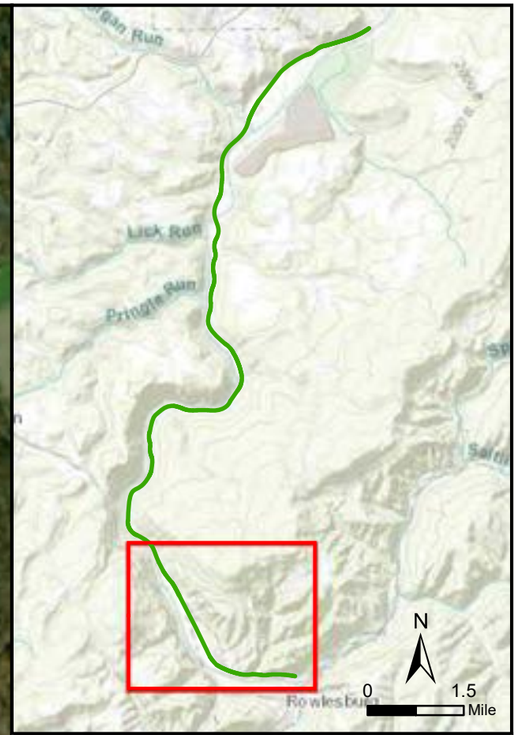


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Figure 4-1
Proposed Sampling Locations (Downgradient 1)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Proposed Sampling Location
- Existing Sampling Locations
- Site Boundary
- 160+00 Station Location
- Rail-Trail

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

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Match Line - See Figure 2-4

SS40C	
9/2/2011	
As	9.98
B(a)P	ND

SS39A	
9/2/2011	
As	**23.80**
B(a)P	0.69

SS3D	
9/2/2011	
As	15.70
B(a)P	0.09

SS2D	
9/2/2011	
As	4.88
B(a)P	**1.67**

SS37C	
9/2/2011	
As	4.29
B(a)P	0.35

SS36A	
9/2/2011	
As	5.41
B(a)P	0.25

SS35B	
9/2/2011	
As	6.31
B(a)P	0.57

SS34C	
9/2/2011	
As	7.01
B(a)P	0.0528J

SS33A	
9/2/2011	
As	13.10
B(a)P	**7.17**

SS30A	
9/2/2011	
As	**23.10**
B(a)P	0.90

SS28C	
9/2/2011	
As	**62.90**
B(a)P	0.11

SS27A	
9/2/2011	
As	7.36
B(a)P	ND

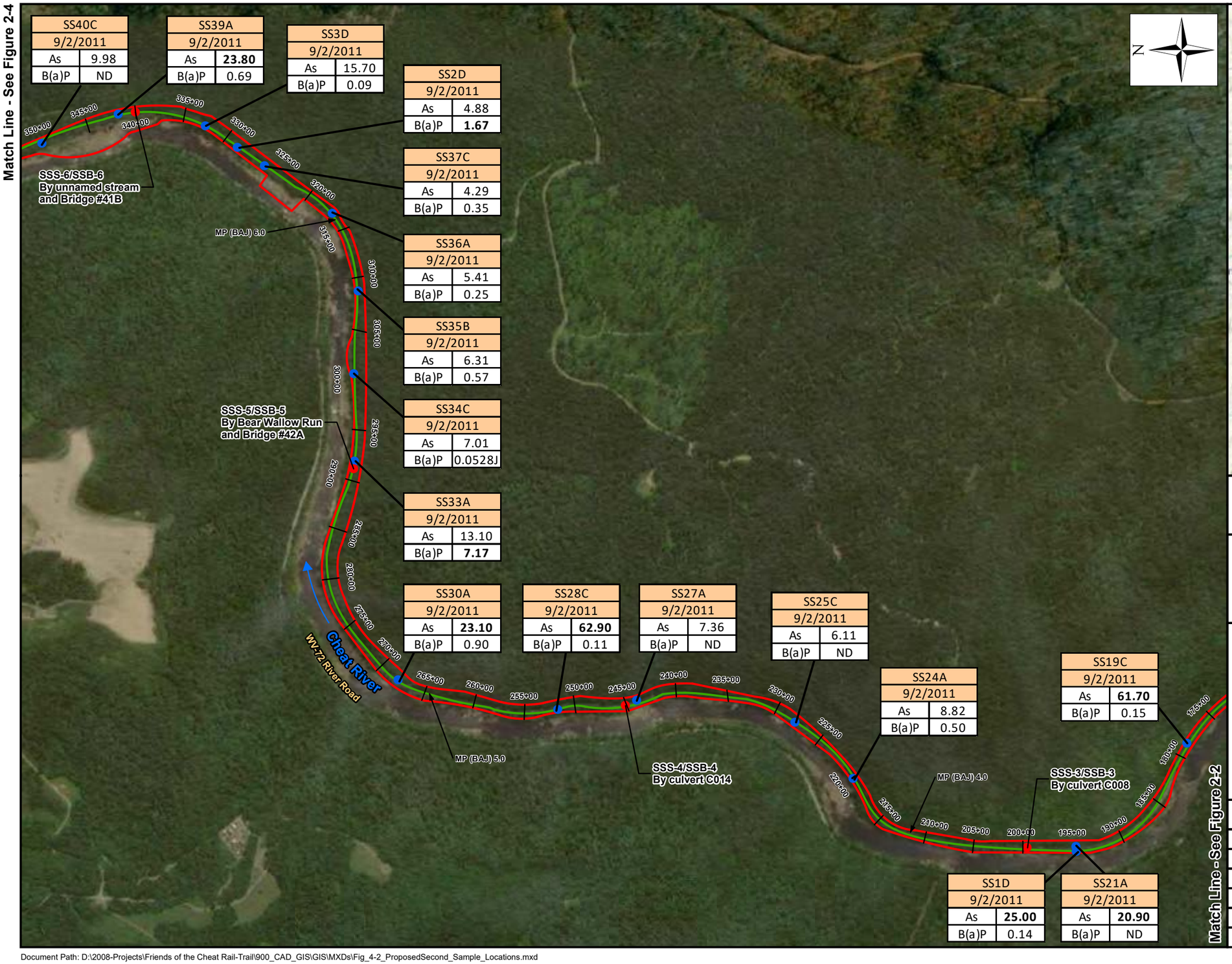
SS25C	
9/2/2011	
As	6.11
B(a)P	ND

SS24A	
9/2/2011	
As	8.82
B(a)P	0.50

SS19C	
9/2/2011	
As	**61.70**
B(a)P	0.15

SS1D	
9/2/2011	
As	**25.00**
B(a)P	0.14

SS21A	
9/2/2011	
As	**20.90**
B(a)P	ND



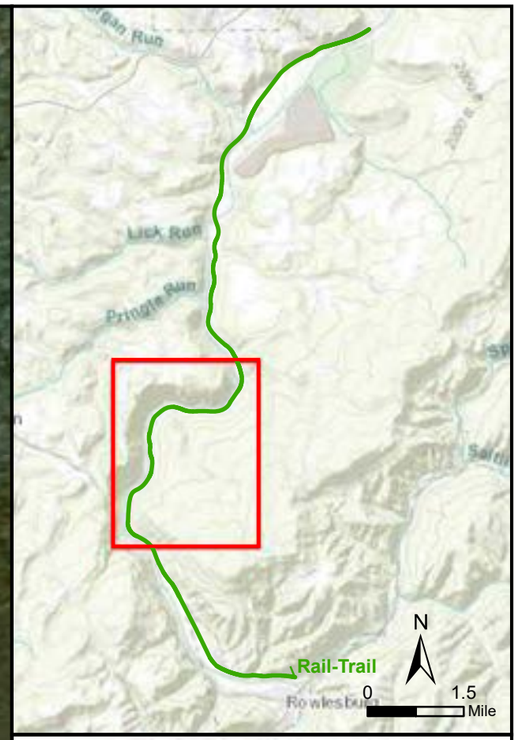


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Figure 4-2
Proposed Sampling Locations (Downgradient 2)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Proposed Sampling Location
- Existing Sampling Locations
- Site Boundary
- 160+00 Station Location
- Rail-Trail

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

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Match Line - See Figure 2-2

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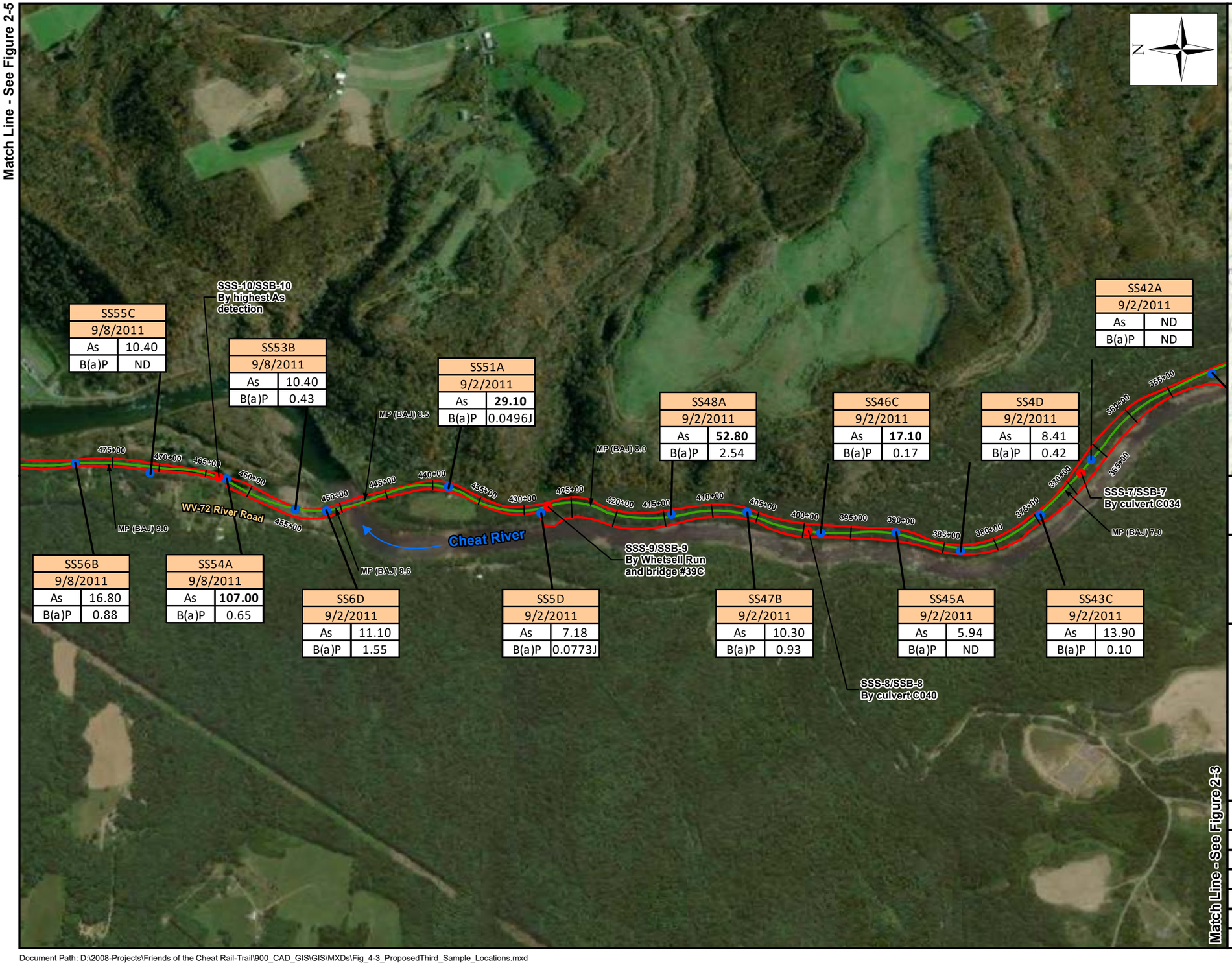
Match Line - See Figure 2-5



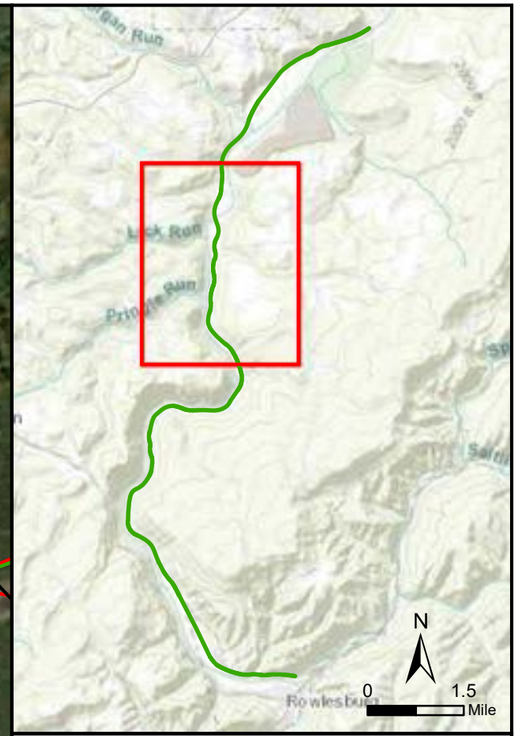


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Figure 4-3
Proposed Sampling Locations (Upgradient 1)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Proposed Sampling Locations
- Existing Sampling Locations
- Site Boundary
- 160+00 Station Location
- Rail-Trail

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

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Match Line - See Figure 2-3

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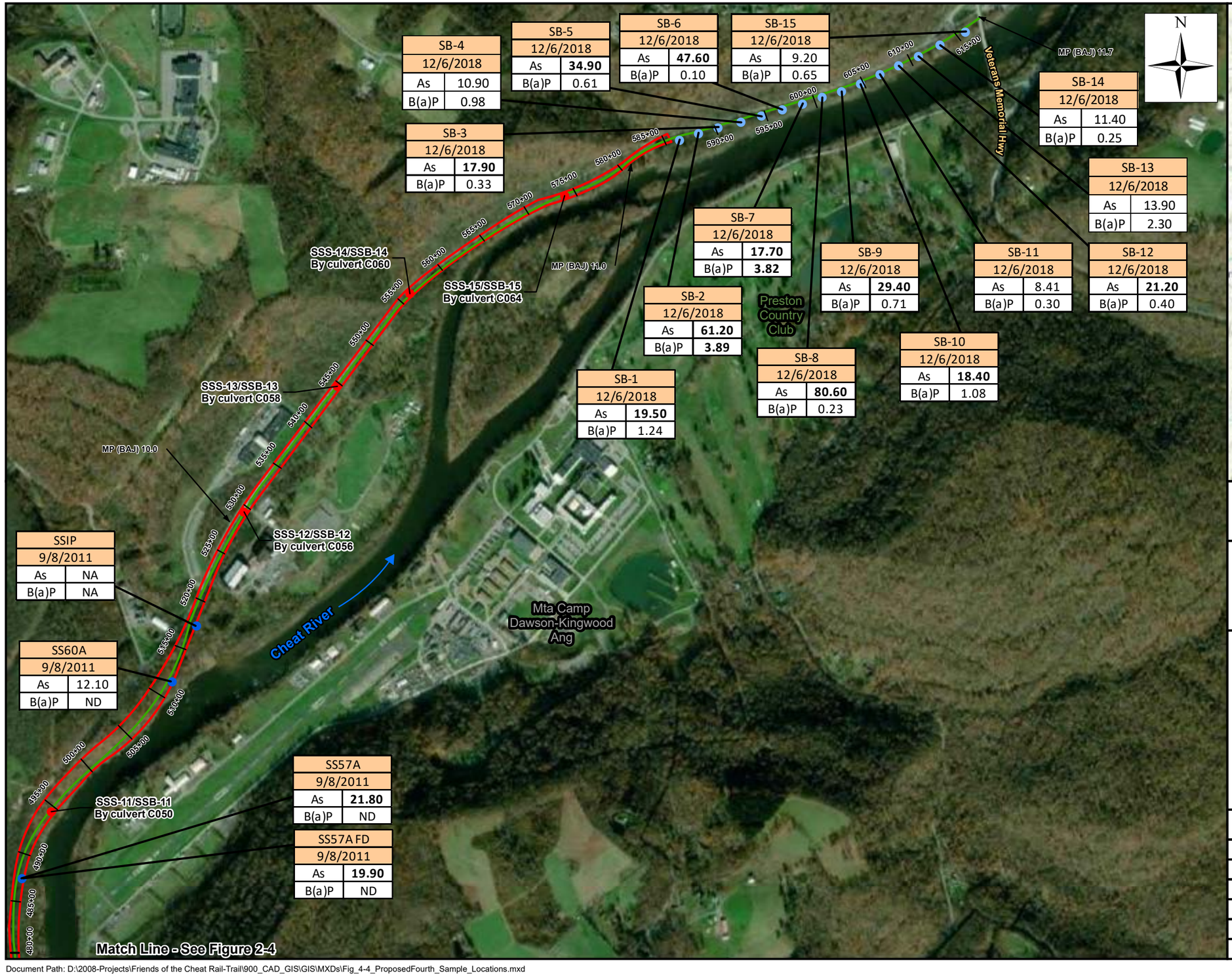

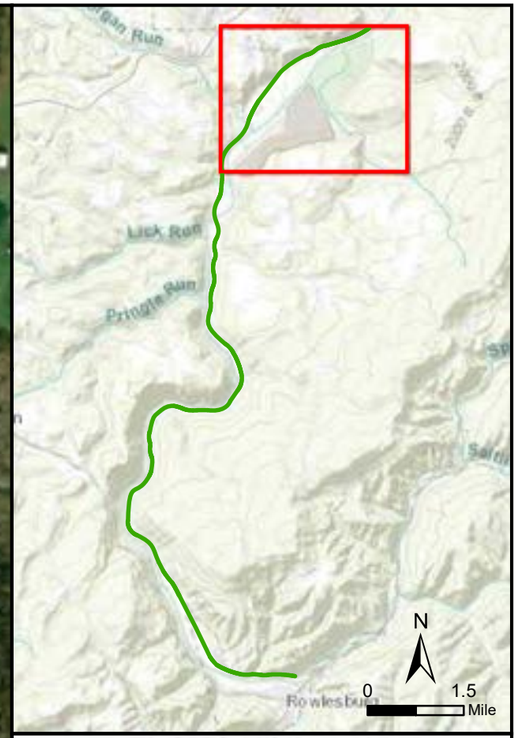

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Figure 4-4

Proposed Sampling Locations (Upgradient 2)
Site Characterization Work Plan
Cheat River Rail-Trail Corridor

Legend

- Existing Sampling Locations, 2018
- Existing Sampling Locations, 2011
- Rail-Trail
- Proposed Sampling Location
- Site Boundary
- 480+00 Station Location

Notes:
1) Site-Specific Standard Recreator Screening Values: As: 16.9 mg/kg, B(a)P: 2.87 mg/kg
2) **Bold** = Screening Value Exceedance

As = Arsenic (mg/kg)
B(a)P = Benzo(a)pyrene (mg/kg)

J = Estimated Value
MP = Mile Post
ND = Not Detected
NA = Not Available
Result = Detected Concentration

0 0.25 0.5 Miles

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Appendix A
Historical Soil Data (2011 and 2018)

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS1C 9/1/2011	SS3A 9/1/2011	SS4C 9/1/2011	SS06A 9/1/2011	SS8B 9/1/2011	SS9A 9/1/2011	SS9A FD 9/1/2011	SS10C 9/1/2011	SS12A 9/1/2011
Metals													
Arsenic	7440-38-2	mg/Kg	0.43	16.9	8.43	13.3	10.1	27.6	16.8	48.1	51.1	22.3	9.84
Lead	7439-92-1	mg/Kg	400	NC	25.5	19.6	21.7	22.5	11	31.7	15.7	18	7.32
SVOCs													
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	24	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
1,2-Dichlorobenzene	95-50-1	mg/Kg	380	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
1,3-Dichlorobenzene	541-73-1	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
1,4-Dichlorobenzene	106-46-7	mg/Kg	2.8	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
1-Methylnaphthalene	90-12-0	mg/Kg	24	NC	ND(<1.79)	0.0505	0.0501	0.115	0.0887	ND(<0.0875)	ND(<0.092)	ND(<0.11)	ND(<0.0743)
2,4,5-Trichlorophenol	95-95-4	mg/Kg	6300	NC	ND(<1.79)	ND(<0.963)	ND(<0.928)	ND(<1.34)	ND(<0.96)	ND(<1.09)	ND(<1.14)	ND(<1.37)	ND(<0.924)
2,4,6-Trichlorophenol	88-06-2	mg/Kg	49	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2,4-Dichlorophenol	120-83-2	mg/Kg	190	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2,4-Dimethylphenol	105-67-9	mg/Kg	1300	NC	ND(<1.79)	ND(<0.222)	ND(<0.214)	ND(<0.309)	ND(<0.221)	ND(<0.251)	ND(<0.264)	ND(<0.316)	ND(<0.213)
2,4-Dinitrophenol	51-28-5	mg/Kg	130	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2,4-Dinitrotoluene	121-14-2	mg/Kg	1.7	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2,6-Dinitrotoluene	606-20-2	mg/Kg	0.36	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2-Chloronaphthalene	91-58-7	mg/Kg	5000	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2-Chlorophenol	95-57-8	mg/Kg	340	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2-Methylnaphthalene	91-57-6	mg/Kg	310	NC	0.265	0.0416	0.075	0.114	0.16	0.0483	0.0503	ND(<0.11)	ND(<0.0743)
2-Methylphenol	95-48-7	mg/Kg	3200	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
2-Nitroaniline	88-74-4	mg/Kg	630	NC	ND(<1.79)	ND(<0.963)	ND(<0.928)	ND(<1.34)	ND(<0.96)	ND(<1.09)	ND(<1.14)	ND(<1.37)	ND(<0.924)
2-Nitrophenol	88-75-5	mg/Kg	NE	NC	ND(<1.79)	ND(<0.227)	ND(<0.218)	ND(<0.316)	ND(<0.226)	ND(<0.256)	ND(<0.269)	ND(<0.322)	ND(<0.217)
3 & 4-Methylphenol	106-44-5	mg/Kg	6300	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	1.2	NC	ND(<1.79)	ND(<0.771)	ND(<0.743)	ND(<1.08)	ND(<0.384)	ND(<0.871)	ND(<0.915)	ND(<1.1)	ND(<0.74)
3-Nitroaniline	99-09-2	mg/Kg	NE	NC	ND(<1.79)	ND(<0.963)	ND(<0.928)	ND(<1.34)	ND(<0.96)	ND(<1.09)	ND(<1.14)	ND(<1.37)	ND(<0.924)
4,6-Dinitro-2-methylphenc	534-52-1	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
4-Bromophenyl phenyl eth	101-55-3	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
4-Chloro-3-methylphenol	35421-08-0	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
4-Chloroaniline	106-47-8	mg/Kg	2.7	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
4-Chlorophenyl phenyl eth	7005-72-3	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
4-Nitroaniline	100-01-6	mg/Kg	NE	NC	ND(<1.79)	ND(<0.963)	ND(<0.928)	ND(<1.34)	ND(<0.96)	ND(<1.09)	ND(<1.14)	ND(<1.37)	ND(<0.924)
4-Nitrophenol	100-02-7	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Acenaphthene	83-32-9	mg/Kg	4100	NC	0.252	0.237	ND(<0.0746)	ND(<0.108)	0.0396	ND(<0.0875)	ND(<0.092)	ND(<0.11)	ND(<0.0743)
Acenaphthylene	208-96-8	mg/Kg	4200	NC	0.825	0.103	0.2	ND(<0.108)	0.329	0.112	0.126	ND(<0.11)	ND(<0.0743)
Anthracene	120-12-7	mg/Kg	23000	NC	1.09	0.825	0.232	ND(<0.108)	0.483	0.0936	0.107	ND(<0.11)	ND(<0.0743)
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	1.45	1.7	0.435	ND(<0.108)	0.695	0.199	0.215	0.0598	ND(<0.0743)

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS1C 9/1/2011	SS3A 9/1/2011	SS4C 9/1/2011	SS06A 9/1/2011	SS8B 9/1/2011	SS9A 9/1/2011	SS9A FD 9/1/2011	SS10C 9/1/2011	SS12A 9/1/2011
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	2.54	1.47	0.613	ND(<0.108)	1.21	0.249	0.254	ND(<0.11)	ND(<0.0743)
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	2.59	1.37	0.911	ND(<0.108)	1.58	0.386	0.361	0.0576	ND(<0.0743)
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	2.49	0.72	0.557	ND(<0.108)	1.16	0.187	0.173	ND(<0.11)	ND(<0.0743)
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	2.85	1.34	0.813	ND(<0.108)	1.64	0.239	0.224	ND(<0.11)	ND(<0.0743)
bis(2-Chloroethoxy)metha	111-91-1	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.768)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
bis(2-Chloroethyl)ether	111-44-4	mg/Kg	0.24	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
bis(2-Chloroisopropyl)ethe	108-60-1	mg/Kg	5.1	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
bis(2-Ethylhexyl)phthalate	117-81-7	mg/Kg	39	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Butyl benzyl phthalate	85-68-7	mg/Kg	290	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Carbazole	86-74-8	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Chrysene	218-01-9	mg/Kg	16	2870	1.88	1.62	0.672	0.0844	0.993	0.289	0.304	0.0647	ND(<0.0743)
Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	0.834	0.294	0.16	ND(<0.108)	0.345	ND(<0.0875)	0.0714	ND(<0.11)	ND(<0.0743)
Dibenzofuran	132-64-9	mg/Kg	78	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Diethyl phthalate	84-66-2	mg/Kg	51000	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Dimethyl phthalate	131-11-3	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Di-n-butyl phthalate	84-74-2	mg/Kg	6300	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	0.209
Di-n-octyl phthalate	117-84-0	mg/Kg	NE	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Fluoranthene	206-44-0	mg/Kg	2400	NC	2.28	3.88	0.62	0.0688	0.708	0.331	0.432	0.116	ND(<0.0743)
Fluorene	86-73-7	mg/Kg	2900	NC	0.249	0.295	ND(<0.0746)	ND(<0.108)	0.0488	ND(<0.0875)	ND(<0.092)	ND(<0.11)	ND(<0.0743)
Hexachlorobenzene	118-74-1	mg/Kg	0.22	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Hexachlorobutadiene	87-68-3	mg/Kg	1.3	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Hexachlorocyclopentadien	77-47-4	mg/Kg	1.9	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Hexachloroethane	67-72-1	mg/Kg	2	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	2.06	0.711	0.472	ND(<0.108)	1.05	0.171	0.152	ND(<0.11)	ND(<0.0743)
Isophorone	78-59-1	mg/Kg	570	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	0.537	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Naphthalene	91-20-3	mg/Kg	4.1	NC	0.34	ND(<0.0775)	0.0609	0.0596	0.124	ND(<0.0875)	0.0467	ND(<0.11)	ND(<0.0743)
Nitrobenzene	98-95-3	mg/Kg	5.5	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
N-Nitroso-di-n-propylamin	621-64-7	mg/Kg	0.078	NC	ND(<1.79)	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
N-Nitrosodiphenylamine	86-30-6	mg/Kg	110	NC	ND(<1.79)	ND(<0.212)	ND(<0.204)	ND(<0.295)	ND(<0.211)	ND(<0.239)	ND(<0.457)	ND(<0.301)	ND(<0.203)
Pentachlorophenol	87-86-5	mg/Kg	1	NC	ND(<1.79)	ND(<0.963)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<1.09)	ND(<1.14)	ND(<1.37)	ND(<0.924)
Phenanthrene	85-01-8	mg/Kg	23000	NC	0.913	3.29	0.144	0.15	0.267	0.114	0.159	ND(<0.11)	ND(<0.0743)
Phenol	108-95-2	mg/Kg	19000	NC	1.79	ND(<0.385)	ND(<0.371)	ND(<0.537)	ND(<0.384)	ND(<0.435)	ND(<0.457)	ND(<0.548)	ND(<0.369)
Pyrene	129-00-0	mg/Kg	2300	NC	2.13	3.34	0.789	0.072	0.922	0.297	0.375	0.104	ND(<0.0743)
Pesticides													
2,4,5-T	93-76-5	mg/Kg	630	NC	NA	NA	NA	NA	NA	0.0375	0.0451	NA	NA
2,4,5-TP (Silvex)	93-72-1	mg/Kg	510	NC	NA	NA	NA	NA	NA	0.0897	0.0232	NA	NA

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS1C 9/1/2011	SS3A 9/1/2011	SS4C 9/1/2011	SS06A 9/1/2011	SS8B 9/1/2011	SS9A 9/1/2011	SS9A FD 9/1/2011	SS10C 9/1/2011	SS12A 9/1/2011
2,4-D	94-75-7	mg/Kg	700	NC	NA	NA	NA	NA	NA	0.0871	0.0912	NA	NA
2,4-DB	94-82-6	mg/Kg	510	NC	NA	NA	NA	NA	NA	0.12	0.0752	NA	NA
Dinoseb	88-85-7	mg/Kg	63	NC	NA	NA	NA	NA	NA	0.0635	0.0912	NA	NA
Pentachlorophenol	87-86-5	mg/Kg	1	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs													
Aroclor 1016	12674-11-2	mg/Kg	5.5	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	11104-28-2	mg/Kg	0.26	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	11141-16-5	mg/Kg	0.22	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	53469-21-9	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	12672-29-6	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	mg/Kg	0.32	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	mg/Kg	0.33	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Level for Residential Soil (June 2020)

Bold: Indicates concentration is above the Site Spesific Stndard Screening Level for Recreator Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-Based Remedies, RBR Consulting, Beaver Falls, PA, April 2012, Table 2-2

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, Triad Engineering, Inc. 219 Hartman Run Road, Morgantown, WV, November 2011

NC - Not calculated

NA - Not applicable

mg/Kg - Milligrams per kilogram

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS13C 9/1/2011	SS14B 9/1/2011	SS15A 9/1/2011	SS16C 9/2/2011	SS16C FD 9/2/2011	SS17B 9/2/2011	SS18A 9/2/2011	SS19C 9/2/2011	SS21A 9/2/2011
Metals													
Arsenic	7440-38-2	mg/Kg	0.43	16.9	8.28	12.6	12.4	10.2	9.73	16.2	23.8	61.7	ND(<20.9)
Lead	7439-92-1	mg/Kg	400	NC	9.82	20.7	16.6	17.6	18.2	18	19	38.9	ND(<20.9)
SVOCs													
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	24	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
1,2-Dichlorobenzene	95-50-1	mg/Kg	380	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
1,3-Dichlorobenzene	541-73-1	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
1,4-Dichlorobenzene	106-46-7	mg/Kg	2.8	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
1-Methylnaphthalene	90-12-0	mg/Kg	24	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	0.0818	ND(<0.133)	0.116	ND(<0.281)
2,4,5-Trichlorophenol	95-95-4	mg/Kg	6300	NC	ND(<1.06)	ND(<1.26)	ND(<1.37)	ND(<1.38)	ND(<1.32)	ND(<1.13)	ND(<1.65)	ND(<1.11)	ND(<3.49)
2,4,6-Trichlorophenol	88-06-2	mg/Kg	49	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2,4-Dichlorophenol	120-83-2	mg/Kg	190	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2,4-Dimethylphenol	105-67-9	mg/Kg	1300	NC	ND(<0.244)	ND(<0.29)	ND(<0.315)	ND(<0.317)	ND(<0.304)	ND(<0.26)	ND(<0.381)	ND(<0.255)	ND(<0.804)
2,4-Dinitrophenol	51-28-5	mg/Kg	130	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2,4-Dinitrotoluene	121-14-2	mg/Kg	1.7	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2,6-Dinitrotoluene	606-20-2	mg/Kg	0.36	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2-Chloronaphthalene	91-58-7	mg/Kg	5000	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2-Chlorophenol	95-57-8	mg/Kg	340	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2-Methylnaphthalene	91-57-6	mg/Kg	310	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	0.0549	0.141	0.0688	0.142	ND(<0.281)
2-Methylphenol	95-48-7	mg/Kg	3200	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
2-Nitroaniline	88-74-4	mg/Kg	630	NC	ND(<1.06)	ND(<1.26)	ND(<1.37)	ND(<1.38)	ND(<1.32)	ND(<1.13)	ND(<1.65)	ND(<1.11)	ND(<3.49)
2-Nitrophenol	88-75-5	mg/Kg	NE	NC	ND(<0.454)	ND(<0.296)	ND(<0.321)	ND(<0.324)	ND(<0.31)	ND(<0.266)	ND(<0.389)	ND(<0.261)	ND(<0.821)
3 & 4-Methylphenol	106-44-5	mg/Kg	6300	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	1.2	NC	ND(<0.849)	ND(<1.01)	ND(<1.06)	ND(<1.1)	ND(<1.06)	ND(<0.905)	ND(<1.32)	ND(<0.887)	ND(<2.79)
3-Nitroaniline	99-09-2	mg/Kg	NE	NC	ND(<1.06)	ND(<1.26)	ND(<1.37)	ND(<1.38)	ND(<1.32)	ND(<1.13)	ND(<1.65)	ND(<1.11)	ND(<3.49)
4,6-Dinitro-2-methylphenc	534-52-1	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
4-Bromophenyl phenyl eth	101-55-3	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
4-Chloro-3-methylphenol	35421-08-0	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
4-Chloroaniline	106-47-8	mg/Kg	2.7	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
4-Chlorophenyl phenyl eth	7005-72-3	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
4-Nitroaniline	100-01-6	mg/Kg	NE	NC	ND(<1.06)	ND(<1.26)	ND(<1.37)	ND(<1.38)	ND(<1.32)	ND(<1.13)	ND(<1.65)	ND(<1.11)	ND(<3.49)
4-Nitrophenol	100-02-7	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Acenaphthene	83-32-9	mg/Kg	4100	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	0.0945	ND(<0.133)	ND(<0.0891)	ND(<0.281)
Acenaphthylene	208-96-8	mg/Kg	4200	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	1.29	0.112	0.0754	ND(<0.281)
Anthracene	120-12-7	mg/Kg	23000	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	1.3	0.132	0.0856	ND(<0.281)
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	ND(<0.0852)	ND(<0.101)	0.121	0.0782	0.0987	5.38	ND(<0.133)	0.128	ND(<0.281)

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS13C 9/1/2011	SS14B 9/1/2011	SS15A 9/1/2011	SS16C 9/2/2011	SS16C FD 9/2/2011	SS17B 9/2/2011	SS18A 9/2/2011	SS19C 9/2/2011	SS21A 9/2/2011
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	0.0573	ND(<0.101)	0.141	0.0787	0.146	8.58	ND(<0.133)	0.15	ND(<0.281)
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	0.084	ND(<0.101)	0.205	0.0782	0.201	11.5	ND(<0.133)	0.217	ND(<0.281)
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	ND(<0.0852)	ND(<0.101)	0.088	ND(<0.111)	0.0733	6.22	ND(<0.133)	0.106	ND(<0.281)
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	0.0564	ND(<0.101)	0.16	0.0633	0.125	NA	ND(<0.133)	0.138	ND(<0.281)
bis(2-Chloroethoxy)metha	111-91-1	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
bis(2-Chloroethyl)ether	111-44-4	mg/Kg	0.24	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
bis(2-Chloroisopropyl)ethe	108-60-1	mg/Kg	5.1	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
bis(2-Ethylhexyl)phthalate	117-81-7	mg/Kg	39	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Butyl benzyl phthalate	85-68-7	mg/Kg	290	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Carbazole	86-74-8	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	0.56	ND(<0.661)	ND(<0.443)	ND(<1.39)
Chrysene	218-01-9	mg/Kg	16	2870	ND(<0.0852)	ND(<0.101)	0.203	0.0754	0.159	7.79	ND(<0.133)	0.181	ND(<0.281)
Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	1.3	ND(<0.133)	ND(<0.0891)	ND(<0.281)
Dibenzofuran	132-64-9	mg/Kg	78	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Diethyl phthalate	84-66-2	mg/Kg	51000	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Dimethyl phthalate	131-11-3	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Di-n-butyl phthalate	84-74-2	mg/Kg	6300	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Di-n-octyl phthalate	117-84-0	mg/Kg	NE	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Fluoranthene	206-44-0	mg/Kg	2400	NC	0.0861	0.086	0.273	0.146	0.155	9.5	ND(<0.133)	0.143	ND(<0.281)
Fluorene	86-73-7	mg/Kg	2900	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	0.152	ND(<0.133)	ND(<0.0891)	ND(<0.281)
Hexachlorobenzene	118-74-1	mg/Kg	0.22	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Hexachlorobutadiene	87-68-3	mg/Kg	1.3	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Hexachlorocyclopentadien	77-47-4	mg/Kg	1.9	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Hexachloroethane	67-72-1	mg/Kg	2	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	ND(<0.0852)	ND(<0.101)	0.0852	ND(<0.111)	0.0702	5.68	ND(<0.133)	0.0927	ND(<0.281)
Isophorone	78-59-1	mg/Kg	570	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Naphthalene	91-20-3	mg/Kg	4.1	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	0.186	ND(<0.133)	0.0865	ND(<0.281)
Nitrobenzene	98-95-3	mg/Kg	5.5	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
N-Nitroso-di-n-propylamin	621-64-7	mg/Kg	0.078	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
N-Nitrosodiphenylamine	86-30-6	mg/Kg	110	NC	ND(<0.233)	ND(<0.276)	ND(<0.3)	ND(<0.302)	ND(<0.29)	ND(<0.248)	ND(<0.363)	ND(<0.243)	ND(<1.3967)
Pentachlorophenol	87-86-5	mg/Kg	1	NC	ND(<1.06)	ND(<1.26)	ND(<1.37)	ND(<1.38)	ND(<1.32)	ND(<1.13)	ND(<1.65)	ND(<1.11)	ND(<3.49)
Phenanthrene	85-01-8	mg/Kg	23000	NC	ND(<0.0852)	ND(<0.101)	ND(<0.11)	ND(<0.111)	ND(<0.106)	0.934	0.0708	0.119	ND(<0.281)
Phenol	108-95-2	mg/Kg	19000	NC	ND(<0.424)	ND(<0.503)	ND(<0.546)	ND(<0.55)	ND(<0.527)	ND(<0.452)	ND(<0.661)	ND(<0.443)	ND(<1.39)
Pyrene	129-00-0	mg/Kg	2300	NC	0.0785	0.0669	0.215	0.121	0.142	9.13	ND(<0.133)	0.168	ND(<0.281)
Pesticides													
2,4,5-T	93-76-5	mg/Kg	630	NC	NA	NA	NA	0.0551	0.0538	NA	NA	NA	NA
2,4,5-TP (Silvex)	93-72-1	mg/Kg	510	NC	NA	NA	NA	0.0284	0.0277	NA	NA	NA	NA

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS13C 9/1/2011	SS14B 9/1/2011	SS15A 9/1/2011	SS16C 9/2/2011	SS16C FD 9/2/2011	SS17B 9/2/2011	SS18A 9/2/2011	SS19C 9/2/2011	SS21A 9/2/2011
2,4-D	94-75-7	mg/Kg	700	NC	NA	NA	NA	0.111	0.109	NA	NA	NA	NA
2,4-DB	94-82-6	mg/Kg	510	NC	NA	NA	NA	0.111	0.109	NA	NA	NA	NA
Dinoseb	88-85-7	mg/Kg	63	NC	NA	NA	NA	0.111	0.109	NA	NA	NA	NA
Pentachlorophenol	87-86-5	mg/Kg	1	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs													
Aroclor 1016	12674-11-2	mg/Kg	5.5	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	11104-28-2	mg/Kg	0.26	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	11141-16-5	mg/Kg	0.22	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	53469-21-9	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	12672-29-6	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	mg/Kg	0.32	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	mg/Kg	0.33	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Lev

Bold: Indicates concentration is above the Site Spesific Stndard Screening Level for Recreator Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-B

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, T

NC - Not calculated

NA - Not applicable

mg/Kg - Milligrams per kilogram

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS1D 9/2/2011	SS24A 9/2/2011	SS25C 9/2/2011	SS27A 9/2/2011	SS28C 9/2/2011	SS30A 9/2/2011	SS33A 9/2/2011	SS34C 9/2/2011	SS35B 9/2/2011
Metals													
Arsenic	7440-38-2	mg/Kg	0.43	16.9	25	8.82	6.11	7.36	62.9	23.1	13.1	7.01	6.31
Lead	7439-92-1	mg/Kg	400	NC	35.5	23.3	16.6	19.1	19.8	16.8	25.2	14.2	24.7
SVOCs													
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	24	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
1,2-Dichlorobenzene	95-50-1	mg/Kg	380	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
1,3-Dichlorobenzene	541-73-1	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
1,4-Dichlorobenzene	106-46-7	mg/Kg	2.8	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
1-Methylnaphthalene	90-12-0	mg/Kg	24	NC	0.163	ND(<0.167)	ND(<0.0809)	ND(<0.082)	0.0522	ND(<0.134)	ND(<0.203)	ND(<0.0923)	ND(<0.132)
2,4,5-Trichlorophenol	95-95-4	mg/Kg	6300	NC	ND(<1.25)	ND(<2.08)	ND(<1.01)	ND(<1.02)	ND(<1.06)	ND(<1.67)	ND(<2.52)	ND(<1.15)	ND(<1.64)
2,4,6-Trichlorophenol	88-06-2	mg/Kg	49	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2,4-Dichlorophenol	120-83-2	mg/Kg	190	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2,4-Dimethylphenol	105-67-9	mg/Kg	1300	NC	ND(<0.288)	ND(<0.479)	ND(<0.232)	ND(<0.235)	ND(<0.244)	ND(<0.666)	ND(<0.582)	ND(<0.264)	ND(<0.655)
2,4-Dinitrophenol	51-28-5	mg/Kg	130	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2,4-Dinitrotoluene	121-14-2	mg/Kg	1.7	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2,6-Dinitrotoluene	606-20-2	mg/Kg	0.36	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2-Chloronaphthalene	91-58-7	mg/Kg	5000	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2-Chlorophenol	95-57-8	mg/Kg	340	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2-Methylnaphthalene	91-57-6	mg/Kg	310	NC	0.185	ND(<0.167)	ND(<0.0809)	ND(<0.082)	0.0586	ND(<0.134)	ND(<0.203)	ND(<0.0923)	0.0938
2-Methylphenol	95-48-7	mg/Kg	3200	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
2-Nitroaniline	88-74-4	mg/Kg	630	NC	ND(<1.25)	ND(<2.08)	ND(<1.01)	ND(<1.02)	ND(<1.06)	ND(<1.67)	ND(<2.52)	ND(<1.15)	ND(<1.64)
2-Nitrophenol	88-75-5	mg/Kg	NE	NC	ND(<0.294)	ND(<0.488)	ND(<0.237)	ND(<0.24)	ND(<0.25)	ND(<0.666)	ND(<0.594)	ND(<0.459)	ND(<0.655)
3 & 4-Methylphenol	106-44-5	mg/Kg	6300	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	1.2	NC	ND(<1)	ND(<1.66)	ND(<0.402)	ND(<0.816)	ND(<0.849)	ND(<1.33)	ND(<2.02)	ND(<0.919)	ND(<1.31)
3-Nitroaniline	99-09-2	mg/Kg	NE	NC	ND(<1.25)	ND(<2.08)	ND(<1.01)	ND(<1.02)	ND(<1.06)	ND(<1.67)	ND(<2.52)	ND(<1.15)	ND(<1.64)
4,6-Dinitro-2-methylphenc	534-52-1	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
4-Bromophenyl phenyl eth	101-55-3	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
4-Chloro-3-methylphenol	35421-08-0	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
4-Chloroaniline	106-47-8	mg/Kg	2.7	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
4-Chlorophenyl phenyl eth	7005-72-3	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
4-Nitroaniline	100-01-6	mg/Kg	NE	NC	ND(<1.25)	ND(<2.08)	ND(<1.01)	ND(<1.02)	ND(<1.06)	ND(<1.67)	ND(<2.52)	ND(<1.15)	ND(<1.64)
4-Nitrophenol	100-02-7	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Acenaphthene	83-32-9	mg/Kg	4100	NC	ND(<0.101)	ND(<0.167)	ND(<0.0809)	ND(<0.082)	ND(<0.0853)	ND(<0.134)	ND(<0.203)	ND(<0.0923)	ND(<0.132)
Acenaphthylene	208-96-8	mg/Kg	4200	NC	0.0685	0.133	ND(<0.0809)	ND(<0.082)	0.0594	0.251	1.72	ND(<0.0923)	0.196
Anthracene	120-12-7	mg/Kg	23000	NC	ND(<0.101)	0.12	ND(<0.0809)	ND(<0.082)	0.0964	0.275	2.23	ND(<0.0923)	0.195
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	0.141	0.414	ND(<0.0809)	ND(<0.082)	0.0789	1.26	8.99	0.0551	0.447

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS1D 9/2/2011	SS24A 9/2/2011	SS25C 9/2/2011	SS27A 9/2/2011	SS28C 9/2/2011	SS30A 9/2/2011	SS33A 9/2/2011	SS34C 9/2/2011	SS35B 9/2/2011
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	0.144	0.5	ND(<0.0809)	ND(<0.082)	0.111	0.899	7.17	0.0528	0.569
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	0.172	0.709	ND(<0.0809)	ND(<0.082)	0.252	1.65	15	0.0859	0.693
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	0.075	0.268	ND(<0.0809)	ND(<0.082)	0.147	0.51	2.98	ND(<0.0923)	0.316
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	0.114	0.459	ND(<0.0809)	ND(<0.082)	0.0955	0.883	7.58	ND(<0.0923)	0.46
bis(2-Chloroethoxy)metha	111-91-1	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
bis(2-Chloroethyl)ether	111-44-4	mg/Kg	0.24	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
bis(2-Chloroisopropyl)ethe	108-60-1	mg/Kg	5.1	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
bis(2-Ethylhexyl)phthalate	117-81-7	mg/Kg	39	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Butyl benzyl phthalate	85-68-7	mg/Kg	290	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Carbazole	86-74-8	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	2.17	ND(<0.459)	ND(<0.655)
Chrysene	218-01-9	mg/Kg	16	2870	0.189	0.559	ND(<0.0809)	ND(<0.082)	0.135	1.6	17.1	0.0937	0.487
Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	ND(<0.101)	0.11	ND(<0.0809)	ND(<0.082)	ND(<0.0853)	0.201	1.28	ND(<0.0923)	0.12
Dibenzofuran	132-64-9	mg/Kg	78	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Diethyl phthalate	84-66-2	mg/Kg	51000	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Dimethyl phthalate	131-11-3	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Di-n-butyl phthalate	84-74-2	mg/Kg	6300	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Di-n-octyl phthalate	117-84-0	mg/Kg	NE	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Fluoranthene	206-44-0	mg/Kg	2400	NC	0.18	0.4	ND(<0.0809)	ND(<0.082)	0.135	3.31	33.3	0.122	0.616
Fluorene	86-73-7	mg/Kg	2900	NC	ND(<0.101)	ND(<0.167)	ND(<0.0809)	ND(<0.082)	ND(<0.0853)	0.068	0.288	ND(<0.0923)	ND(<0.132)
Hexachlorobenzene	118-74-1	mg/Kg	0.22	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Hexachlorobutadiene	87-68-3	mg/Kg	1.3	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Hexachlorocyclopentadien	77-47-4	mg/Kg	1.9	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Hexachloroethane	67-72-1	mg/Kg	2	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	0.068	0.3	ND(<0.0809)	ND(<0.082)	0.116	0.52	3.29	ND(<0.0923)	0.31
Isophorone	78-59-1	mg/Kg	570	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Naphthalene	91-20-3	mg/Kg	4.1	NC	0.106	ND(<0.167)	ND(<0.0809)	ND(<0.082)	0.0467	ND(<0.134)	ND(<0.203)	ND(<0.0923)	ND(<0.132)
Nitrobenzene	98-95-3	mg/Kg	5.5	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
N-Nitroso-di-n-propylamin	621-64-7	mg/Kg	0.078	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
N-Nitrosodiphenylamine	86-30-6	mg/Kg	110	NC	ND(<0.275)	ND(<0.456)	ND(<0.221)	ND(<0.224)	ND(<0.233)	ND(<0.366)	ND(<0.554)	ND(<0.459)	ND(<0.655)
Pentachlorophenol	87-86-5	mg/Kg	1	NC	ND(<1.25)	ND(<2.08)	ND(<1.01)	ND(<1.02)	ND(<1.06)	ND(<1.67)	ND(<2.52)	ND(<1.15)	ND(<1.64)
Phenanthrene	85-01-8	mg/Kg	23000	NC	ND(<0.101)	ND(<0.167)	ND(<0.0809)	ND(<0.082)	0.0874	0.265	0.873	ND(<0.0923)	0.121
Phenol	108-95-2	mg/Kg	19000	NC	ND(<0.5)	ND(<0.83)	ND(<0.402)	ND(<0.407)	ND(<0.424)	ND(<0.666)	ND(<1.01)	ND(<0.459)	ND(<0.655)
Pyrene	129-00-0	mg/Kg	2300	NC	0.216	0.433	ND(<0.0809)	ND(<0.082)	0.113	2.55	31	0.114	0.635
Pesticides													
2,4,5-T	93-76-5	mg/Kg	630	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	93-72-1	mg/Kg	510	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS1D 9/2/2011	SS24A 9/2/2011	SS25C 9/2/2011	SS27A 9/2/2011	SS28C 9/2/2011	SS30A 9/2/2011	SS33A 9/2/2011	SS34C 9/2/2011	SS35B 9/2/2011
2,4-D	94-75-7	mg/Kg	700	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB	94-82-6	mg/Kg	510	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	88-85-7	mg/Kg	63	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	mg/Kg	1	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs													
Aroclor 1016	12674-11-2	mg/Kg	5.5	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	11104-28-2	mg/Kg	0.26	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	11141-16-5	mg/Kg	0.22	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	53469-21-9	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	12672-29-6	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	mg/Kg	0.32	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	mg/Kg	0.33	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Lev

Bold: Indicates concentration is above the Site Spesific Stndard Screening Level for Recreator Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-B

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, T

NC - Not calculated

NA - Not applicable

mg/Kg - Milligrams per kilogram

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS36A 9/2/2011	SS37C 9/2/2011	SS2D 9/2/2011	SS3D 9/2/2011	SS39A 9/2/2011	SS40C 9/2/2011	SS42A 9/2/2011	SS43C 9/2/2011	SS4D 9/2/2011
Metals													
Arsenic	7440-38-2	mg/Kg	0.43	16.9	5.41	4.29	4.88	15.7	23.8	9.98	9.92	13.9	8.41
Lead	7439-92-1	mg/Kg	400	NC	16.2	12.4	9.31	44.7	17.9	22.3	12.2	22	13
SVOCs													
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	24	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
1,2-Dichlorobenzene	95-50-1	mg/Kg	380	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
1,3-Dichlorobenzene	541-73-1	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
1,4-Dichlorobenzene	106-46-7	mg/Kg	2.8	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
1-Methylnaphthalene	90-12-0	mg/Kg	24	NC	ND(<0.0913)	ND(<0.0854)	ND(<0.102)	0.053	ND(<0.0833)	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	ND(<0.0806)
2,4,5-Trichlorophenol	95-95-4	mg/Kg	6300	NC	ND(<1.13)	ND(<1.06)	ND(<1.27)	ND(<0.947)	ND(<1.04)	ND(<1.01)	ND(<1.66)	ND(<1.04)	ND(<1.08)
2,4,6-Trichlorophenol	88-06-2	mg/Kg	49	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2,4-Dichlorophenol	120-83-2	mg/Kg	190	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2,4-Dimethylphenol	105-67-9	mg/Kg	1300	NC	ND(<0.454)	ND(<0.245)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.416)	ND(<0.43)
2,4-Dinitrophenol	51-28-5	mg/Kg	130	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2,4-Dinitrotoluene	121-14-2	mg/Kg	1.7	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2,6-Dinitrotoluene	606-20-2	mg/Kg	0.36	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2-Chloronaphthalene	91-58-7	mg/Kg	5000	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2-Chlorophenol	95-57-8	mg/Kg	340	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2-Methylnaphthalene	91-57-6	mg/Kg	310	NC	ND(<0.0913)	ND(<0.0854)	ND(<0.102)	0.0527	ND(<0.0833)	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	ND(<0.0806)
2-Methylphenol	95-48-7	mg/Kg	3200	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
2-Nitroaniline	88-74-4	mg/Kg	630	NC	ND(<1.13)	ND(<1.06)	ND(<1.27)	ND(<0.947)	ND(<1.04)	ND(<1.01)	ND(<1.66)	ND(<1.04)	ND(<1.08)
2-Nitrophenol	88-75-5	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.4165)	ND(<0.43)
3 & 4-Methylphenol	106-44-5	mg/Kg	6300	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	1.2	NC	ND(<0.909)	ND(<0.85)	ND(<1.02)	ND(<0.758)	ND(<0.829)	ND(<0.808)	ND(<1.33)	ND(<0.833)	ND(<0.862)
3-Nitroaniline	99-09-2	mg/Kg	NE	NC	ND(<1.13)	ND(<1.06)	ND(<1.27)	ND(<0.947)	ND(<1.04)	ND(<0.404)	ND(<1.66)	ND(<1.04)	ND(<1.08)
4,6-Dinitro-2-methylphenc	534-52-1	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
4-Bromophenyl phenyl eth	101-55-3	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
4-Chloro-3-methylphenol	35421-08-0	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
4-Chloroaniline	106-47-8	mg/Kg	2.7	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
4-Chlorophenyl phenyl eth	7005-72-3	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
4-Nitroaniline	100-01-6	mg/Kg	NE	NC	ND(<1.13)	ND(<1.06)	ND(<1.27)	ND(<0.947)	ND(<1.04)	ND(<1.01)	ND(<1.66)	ND(<1.04)	ND(<1.08)
4-Nitrophenol	100-02-7	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Acenaphthene	83-32-9	mg/Kg	4100	NC	ND(<0.0913)	ND(<0.0854)	ND(<0.102)	ND(<0.0761)	ND(<0.0833)	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	ND(<0.0806)
Acenaphthylene	208-96-8	mg/Kg	4200	NC	0.0481	0.244	0.635	0.0618	0.181	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	0.393
Anthracene	120-12-7	mg/Kg	23000	NC	ND(<0.0913)	0.237	0.736	0.0549	0.192	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	0.285
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	0.26	0.427	2.39	0.102	0.749	ND(<0.0812)	ND(<0.134)	0.0837	0.502

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS36A 9/2/2011	SS37C 9/2/2011	SS2D 9/2/2011	SS3D 9/2/2011	SS39A 9/2/2011	SS40C 9/2/2011	SS42A 9/2/2011	SS43C 9/2/2011	SS4D 9/2/2011
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	0.25	0.347	1.67	0.094	0.687	ND(<0.0812)	ND(<0.134)	0.1	0.421
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	0.251	0.678	2.85	0.184	0.982	0.0699	ND(<0.134)	0.139	0.543
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	0.133	0.268	0.975	0.0568	0.373	ND(<0.0812)	ND(<0.134)	0.0591	0.199
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	0.155	0.618	2.11	0.0837	0.927	ND(<0.0812)	ND(<0.134)	0.0991	0.476
bis(2-Chloroethoxy)metha	111-91-1	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
bis(2-Chloroethyl)ether	111-44-4	mg/Kg	0.24	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
bis(2-Chloroisopropyl)ethe	108-60-1	mg/Kg	5.1	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
bis(2-Ethylhexyl)phthalate	117-81-7	mg/Kg	39	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	0.227	ND(<0.43)
Butyl benzyl phthalate	85-68-7	mg/Kg	290	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Carbazole	86-74-8	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Chrysene	218-01-9	mg/Kg	16	2870	0.253	0.77	2.97	0.156	1.06	ND(<0.0812)	ND(<0.134)	0.128	0.69
Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	0.0468	0.0952	0.392	ND(<0.0761)	0.161	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	0.0922
Dibenzofuran	132-64-9	mg/Kg	78	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Diethyl phthalate	84-66-2	mg/Kg	51000	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Dimethyl phthalate	131-11-3	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Di-n-butyl phthalate	84-74-2	mg/Kg	6300	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Di-n-octyl phthalate	117-84-0	mg/Kg	NE	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Fluoranthene	206-44-0	mg/Kg	2400	NC	0.447	1.75	3.32	0.168	0.83	0.059	ND(<0.134)	0.168	0.874
Fluorene	86-73-7	mg/Kg	2900	NC	ND(<0.0913)	ND(<0.0854)	0.0814	ND(<0.0761)	ND(<0.0833)	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	ND(<0.0806)
Hexachlorobenzene	118-74-1	mg/Kg	0.22	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Hexachlorobutadiene	87-68-3	mg/Kg	1.3	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Hexachlorocyclopentadien	77-47-4	mg/Kg	1.9	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Hexachloroethane	67-72-1	mg/Kg	2	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	0.132	0.281	1.04	0.0519	0.397	ND(<0.0812)	ND(<0.134)	0.0558	0.205
Isophorone	78-59-1	mg/Kg	570	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Naphthalene	91-20-3	mg/Kg	4.1	NC	ND(<0.0913)	ND(<0.0854)	ND(<0.102)	ND(<0.0761)	ND(<0.0833)	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	ND(<0.0806)
Nitrobenzene	98-95-3	mg/Kg	5.5	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
N-Nitroso-di-n-propylamin	621-64-7	mg/Kg	0.078	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
N-Nitrosodiphenylamine	86-30-6	mg/Kg	110	NC	ND(<0.454)	ND(<0.425)	ND(<0.508)	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.416)	ND(<0.43)
Pentachlorophenol	87-86-5	mg/Kg	1	NC	ND(<1.13)	ND(<1.06)	ND(<1.27)	ND(<0.947)	ND(<1.04)	ND(<1.01)	ND(<1.66)	ND(<1.04)	ND(<1.08)
Phenanthrene	85-01-8	mg/Kg	23000	NC	ND(<0.0913)	0.457	0.285	0.089	0.0978	ND(<0.0812)	ND(<0.134)	ND(<0.0837)	0.0848
Phenol	108-95-2	mg/Kg	19000	NC	ND(<0.454)	ND(<0.425)	0.542	ND(<0.378)	ND(<0.414)	ND(<0.404)	ND(<0.665)	ND(<0.209)	ND(<0.43)
Pyrene	129-00-0	mg/Kg	2300	NC	0.393	1.14	3.46	0.177	0.954	0.0533	ND(<0.134)	0.147	0.971
Pesticides													
2,4,5-T	93-76-5	mg/Kg	630	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	93-72-1	mg/Kg	510	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS36A 9/2/2011	SS37C 9/2/2011	SS2D 9/2/2011	SS3D 9/2/2011	SS39A 9/2/2011	SS40C 9/2/2011	SS42A 9/2/2011	SS43C 9/2/2011	SS4D 9/2/2011
2,4-D	94-75-7	mg/Kg	700	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB	94-82-6	mg/Kg	510	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	88-85-7	mg/Kg	63	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	mg/Kg	1	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs													
Aroclor 1016	12674-11-2	mg/Kg	5.5	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	11104-28-2	mg/Kg	0.26	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	11141-16-5	mg/Kg	0.22	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	53469-21-9	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	12672-29-6	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	mg/Kg	0.32	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	mg/Kg	0.33	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Lev

Bold: Indicates concentration is above the Site Spesific Stndard Screening Level for Recreator Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-B

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, T

NC - Not calculated

NA - Not applicable

mg/Kg - Milligrams per kilogram

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS45A 9/2/2011	SS46C 9/2/2011	SS47B 9/2/2011	SS48A 9/2/2011	SS5D 9/2/2011	SS51A 9/2/2011	SS6D 9/2/2011	SS53B 9/8/2011	SS54A 9/8/2011
Metals													
Arsenic	7440-38-2	mg/Kg	0.43	16.9	5.94	ND(<17.1)	10.3	52.8	7.18	29.1	11.1	10.4	107
Lead	7439-92-1	mg/Kg	400	NC	18.3	ND(<40.4)	13.6	31	16.3	49.5	25.2	8.64	46
SVOCs													
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	24	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
1,2-Dichlorobenzene	95-50-1	mg/Kg	380	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
1,3-Dichlorobenzene	541-73-1	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
1,4-Dichlorobenzene	106-46-7	mg/Kg	2.8	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
1-Methylnaphthalene	90-12-0	mg/Kg	24	NC	ND(<0.0861)	0.0857	ND(<0.0711)	ND(<0.149)	ND(<0.0809)	ND(<0.0924)	0.258	0.387	0.179
2,4,5-Trichlorophenol	95-95-4	mg/Kg	6300	NC	ND(<1.07)	ND(<1.07)	ND(<1.08)	ND(<1.86)	ND(<1.01)	ND(<1.15)	ND(<1.2)	ND(<0.979)	ND(<1.14)
2,4,6-Trichlorophenol	88-06-2	mg/Kg	49	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2,4-Dichlorophenol	120-83-2	mg/Kg	190	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2,4-Dimethylphenol	105-67-9	mg/Kg	1300	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2,4-Dinitrophenol	51-28-5	mg/Kg	130	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2,4-Dinitrotoluene	121-14-2	mg/Kg	1.7	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2,6-Dinitrotoluene	606-20-2	mg/Kg	0.36	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2-Chloronaphthalene	91-58-7	mg/Kg	5000	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2-Chlorophenol	95-57-8	mg/Kg	340	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2-Methylnaphthalene	91-57-6	mg/Kg	310	NC	ND(<0.0861)	0.0947	ND(<0.114)	0.103	ND(<0.0809)	ND(<0.0924)	0.478	0.635	0.191
2-Methylphenol	95-48-7	mg/Kg	3200	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
2-Nitroaniline	88-74-4	mg/Kg	630	NC	ND(<1.07)	ND(<1.07)	ND(<1.08)	ND(<1.86)	ND(<1.01)	ND(<1.15)	ND(<1.2)	ND(<0.979)	ND(<1.14)
2-Nitrophenol	88-75-5	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.4335)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
3 & 4-Methylphenol	106-44-5	mg/Kg	6300	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	1.2	NC	ND(<0.857)	ND(<0.858)	ND(<0.867)	ND(<1.49)	ND(<0.805)	ND(<0.92)	ND(<0.963)	ND(<0.784)	ND(<0.911)
3-Nitroaniline	99-09-2	mg/Kg	NE	NC	ND(<1.07)	ND(<1.07)	ND(<1.08)	ND(<1.86)	ND(<1.01)	ND(<1.15)	ND(<1.2)	ND(<0.979)	ND(<1.14)
4,6-Dinitro-2-methylphenc	534-52-1	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
4-Bromophenyl phenyl eth	101-55-3	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
4-Chloro-3-methylphenol	35421-08-0	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
4-Chloroaniline	106-47-8	mg/Kg	2.7	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
4-Chlorophenyl phenyl eth	7005-72-3	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
4-Nitroaniline	100-01-6	mg/Kg	NE	NC	ND(<1.07)	ND(<1.07)	1.08	ND(<1.86)	ND(<1.01)	ND(<1.15)	ND(<1.2)	ND(<0.979)	ND(<1.14)
4-Nitrophenol	100-02-7	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Acenaphthene	83-32-9	mg/Kg	4100	NC	ND(<0.0861)	ND(<0.0862)	0.113	0.0803	ND(<0.0809)	ND(<0.0924)	0.216	0.225	ND(<0.0915)
Acenaphthylene	208-96-8	mg/Kg	4200	NC	ND(<0.0861)	0.111	0.318	0.869	0.0415	ND(<0.0924)	0.631	0.0941	0.494
Anthracene	120-12-7	mg/Kg	23000	NC	ND(<0.0861)	0.0832	0.375	0.911	0.0439	ND(<0.0924)	0.74	0.265	0.443
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	ND(<0.0861)	0.174	ND(<0.736)	2.48	0.0733	0.051	1.42	0.421	0.503

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS45A 9/2/2011	SS46C 9/2/2011	SS47B 9/2/2011	SS48A 9/2/2011	SS5D 9/2/2011	SS51A 9/2/2011	SS6D 9/2/2011	SS53B 9/8/2011	SS54A 9/8/2011
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	ND(<0.0861)	0.168	ND(<0.927)	2.54	0.0773	0.0496	1.55	0.434	0.649
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	ND(<0.0861)	0.214	ND(<1.36)	3.25	0.123	0.103	2.84	0.776	1.29
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	ND(<0.0861)	0.0939	ND(<0.598)	1.4	0.0632	ND(<0.0924)	1	0.27	0.481
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	ND(<0.0861)	0.14	ND(<0.938)	2.79	0.0914	0.0836	1.95	0.484	0.642
bis(2-Chloroethoxy)metha	111-91-1	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
bis(2-Chloroethyl)ether	111-44-4	mg/Kg	0.24	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
bis(2-Chloroisopropyl)ethe	108-60-1	mg/Kg	5.1	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
bis(2-Ethylhexyl)phthalate	117-81-7	mg/Kg	39	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	2.83	ND(<0.392)	ND(<0.455)
Butyl benzyl phthalate	85-68-7	mg/Kg	290	NC	ND(<0.428)	ND(<0.428)	0.433	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Carbazole	86-74-8	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Chrysene	218-01-9	mg/Kg	16	2870	ND(<0.0861)	0.229	1.11	3.05	0.101	0.133	2.05	0.636	0.888
Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	ND(<0.0861)	ND(<0.0862)	0.232	0.558	ND(<0.0809)	ND(<0.0924)	0.417	0.121	0.23
Dibenzofuran	132-64-9	mg/Kg	78	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	0.597	0.579	ND(<0.455)
Diethyl phthalate	84-66-2	mg/Kg	51000	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Dimethyl phthalate	131-11-3	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Di-n-butyl phthalate	84-74-2	mg/Kg	6300	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Di-n-octyl phthalate	117-84-0	mg/Kg	NE	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Fluoranthene	206-44-0	mg/Kg	2400	NC	ND(<0.0861)	0.268	1.45	2.98	0.139	0.0657	2.27	0.917	0.678
Fluorene	86-73-7	mg/Kg	2900	NC	ND(<0.0861)	ND(<0.0862)	0.102	0.137	ND(<0.0809)	ND(<0.0924)	0.222	0.147	0.0615
Hexachlorobenzene	118-74-1	mg/Kg	0.22	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Hexachlorobutadiene	87-68-3	mg/Kg	1.3	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Hexachlorocyclopentadien	77-47-4	mg/Kg	1.9	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Hexachloroethane	67-72-1	mg/Kg	2	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	ND(<0.0861)	0.0845	0.617	1.42	0.0604	ND(<0.0924)	1.11	0.281	0.503
Isophorone	78-59-1	mg/Kg	570	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Naphthalene	91-20-3	mg/Kg	4.1	NC	ND(<0.0861)	0.0592	0.137	0.123	ND(<0.0809)	ND(<0.0924)	0.815	0.515	0.163
Nitrobenzene	98-95-3	mg/Kg	5.5	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
N-Nitroso-di-n-propylamin	621-64-7	mg/Kg	0.078	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
N-Nitrosodiphenylamine	86-30-6	mg/Kg	110	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Pentachlorophenol	87-86-5	mg/Kg	1	NC	ND(<1.07)	ND(<1.07)	ND(<1.08)	ND(<1.86)	ND(<1.01)	ND(<1.15)	ND(<1.2)	ND(<0.979)	ND(<1.14)
Phenanthrene	85-01-8	mg/Kg	23000	NC	ND(<0.0861)	0.144	0.368	0.445	0.0439	ND(<0.0924)	1.36	0.852	0.376
Phenol	108-95-2	mg/Kg	19000	NC	ND(<0.428)	ND(<0.428)	ND(<0.433)	ND(<0.743)	ND(<0.402)	ND(<0.459)	ND(<0.481)	ND(<0.392)	ND(<0.455)
Pyrene	129-00-0	mg/Kg	2300	NC	ND(<0.0861)	ND(<0.0862)	1.32	2.98	0.111	0.0579	2.03	0.779	0.967
Pesticides													
2,4,5-T	93-76-5	mg/Kg	630	NC	0.0428	NA	0.043	NA	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	93-72-1	mg/Kg	510	NC	0.022	NA	0.0222	NA	NA	NA	NA	NA	NA

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS45A 9/2/2011	SS46C 9/2/2011	SS47B 9/2/2011	SS48A 9/2/2011	SS5D 9/2/2011	SS51A 9/2/2011	SS6D 9/2/2011	SS53B 9/8/2011	SS54A 9/8/2011
2,4-D	94-75-7	mg/Kg	700	NC	0.0865	NA	0.087	NA	NA	NA	NA	NA	NA
2,4-DB	94-82-6	mg/Kg	510	NC	0.0865	NA	0.087	NA	NA	NA	NA	NA	NA
Dinoseb	88-85-7	mg/Kg	63	NC	0.0865	NA	0.087	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	mg/Kg	1	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs													
Aroclor 1016	12674-11-2	mg/Kg	5.5	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	11104-28-2	mg/Kg	0.26	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	11141-16-5	mg/Kg	0.22	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	53469-21-9	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	12672-29-6	mg/Kg	0.31	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	mg/Kg	0.32	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	mg/Kg	0.33	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Lev

Bold: Indicates concentration is above the Site Spesific Stndard Screening Level for Recreator Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-B

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, T

NC - Not calculated

NA - Not applicable

mg/Kg - Milligrams per kilogram

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS55C 9/8/2011	SS56B 9/8/2011	SS60A 9/8/2011	SSIP 9/8/2011	SS57A 9/8/2011	SS57A FD 9/8/2011
Metals										
Arsenic	7440-38-2	mg/Kg	0.43	16.9	10.4	16.8	12.1	NA	21.8	19.9
Lead	7439-92-1	mg/Kg	400	NC	17.9	33.8	25.3	NA	20.6	23.5
SVOCs										
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	24	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
1,2-Dichlorobenzene	95-50-1	mg/Kg	380	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
1,3-Dichlorobenzene	541-73-1	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
1,4-Dichlorobenzene	106-46-7	mg/Kg	2.8	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
1-Methylnaphthalene	90-12-0	mg/Kg	24	NC	ND(<0.0846)	0.165	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
2,4,5-Trichlorophenol	95-95-4	mg/Kg	6300	NC	ND(<1.05)	ND(<1.11)	ND(<1.14)	NA	ND(<1.11)	ND(<1.28)
2,4,6-Trichlorophenol	88-06-2	mg/Kg	49	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2,4-Dichlorophenol	120-83-2	mg/Kg	190	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2,4-Dimethylphenol	105-67-9	mg/Kg	1300	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2,4-Dinitrophenol	51-28-5	mg/Kg	130	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2,4-Dinitrotoluene	121-14-2	mg/Kg	1.7	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2,6-Dinitrotoluene	606-20-2	mg/Kg	0.36	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2-Chloronaphthalene	91-58-7	mg/Kg	5000	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2-Chlorophenol	95-57-8	mg/Kg	340	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2-Methylnaphthalene	91-57-6	mg/Kg	310	NC	ND(<0.0846)	0.266	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
2-Methylphenol	95-48-7	mg/Kg	3200	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
2-Nitroaniline	88-74-4	mg/Kg	630	NC	ND(<1.05)	ND(<1.11)	ND(<1.14)	NA	ND(<1.11)	ND(<1.28)
2-Nitrophenol	88-75-5	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
3 & 4-Methylphenol	106-44-5	mg/Kg	6300	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	1.2	NC	ND(<0.842)	ND(<0.892)	ND(<0.913)	NA	ND(<0.889)	ND(<0.514)
3-Nitroaniline	99-09-2	mg/Kg	NE	NC	ND(<1.05)	ND(<1.11)	ND(<1.14)	NA	ND(<1.11)	ND(<1.28)
4,6-Dinitro-2-methylphenc	534-52-1	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
4-Bromophenyl phenyl eth	101-55-3	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
4-Chloro-3-methylphenol	35421-08-0	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
4-Chloroaniline	106-47-8	mg/Kg	2.7	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
4-Chlorophenyl phenyl eth	7005-72-3	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
4-Nitroaniline	100-01-6	mg/Kg	NE	NC	ND(<1.05)	ND(<1.11)	ND(<1.14)	NA	ND(<1.11)	ND(<1.28)
4-Nitrophenol	100-02-7	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Acenaphthene	83-32-9	mg/Kg	4100	NC	ND(<0.0846)	0.0521	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Acenaphthylene	208-96-8	mg/Kg	4200	NC	ND(<0.0846)	0.241	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Anthracene	120-12-7	mg/Kg	23000	NC	ND(<0.0846)	0.35	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	ND(<0.0846)	0.659	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS55C 9/8/2011	SS56B 9/8/2011	SS60A 9/8/2011	SSIP 9/8/2011	SS57A 9/8/2011	SS57A FD 9/8/2011
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	ND(<0.0846)	0.881	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	ND(<0.0846)	1.37	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	ND(<0.0846)	0.608	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	ND(<0.0846)	1.22	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
bis(2-Chloroethoxy)metha	111-91-1	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
bis(2-Chloroethyl)ether	111-44-4	mg/Kg	0.24	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
bis(2-Chloroisopropyl)ethe	108-60-1	mg/Kg	5.1	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
bis(2-Ethylhexyl)phthalate	117-81-7	mg/Kg	39	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Butyl benzyl phthalate	85-68-7	mg/Kg	290	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Carbazole	86-74-8	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Chrysene	218-01-9	mg/Kg	16	2870	ND(<0.0846)	0.923	0.0493	NA	ND(<0.0893)	ND(<0.103)
Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	ND(<0.0846)	0.185	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Dibenzofuran	132-64-9	mg/Kg	78	NC	ND(<0.42)	0.224	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Diethyl phthalate	84-66-2	mg/Kg	51000	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Dimethyl phthalate	131-11-3	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Di-n-butyl phthalate	84-74-2	mg/Kg	6300	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Di-n-octyl phthalate	117-84-0	mg/Kg	NE	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Fluoranthene	206-44-0	mg/Kg	2400	NC	ND(<0.0846)	0.899	0.0488	NA	ND(<0.0893)	0.0576
Fluorene	86-73-7	mg/Kg	2900	NC	ND(<0.0846)	0.0726	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Hexachlorobenzene	118-74-1	mg/Kg	0.22	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Hexachlorobutadiene	87-68-3	mg/Kg	1.3	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Hexachlorocyclopentadien	77-47-4	mg/Kg	1.9	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Hexachloroethane	67-72-1	mg/Kg	2	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	ND(<0.0846)	0.683	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Isophorone	78-59-1	mg/Kg	570	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Naphthalene	91-20-3	mg/Kg	4.1	NC	ND(<0.0846)	0.222	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Nitrobenzene	98-95-3	mg/Kg	5.5	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
N-Nitroso-di-n-propylamin	621-64-7	mg/Kg	0.078	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
N-Nitrosodiphenylamine	86-30-6	mg/Kg	110	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Pentachlorophenol	87-86-5	mg/Kg	1	NC	ND(<1.05)	ND(<1.11)	ND(<1.14)	NA	ND(<1.11)	ND(<1.28)
Phenanthrene	85-01-8	mg/Kg	23000	NC	ND(<0.0846)	0.442	ND(<0.0917)	NA	ND(<0.0893)	ND(<0.103)
Phenol	108-95-2	mg/Kg	19000	NC	ND(<0.42)	ND(<0.445)	ND(<0.456)	NA	ND(<0.444)	ND(<0.514)
Pyrene	129-00-0	mg/Kg	2300	NC	ND(<0.0846)	1.06	0.0557	NA	ND(<0.0893)	0.0658
Pesticides										
2,4,5-T	93-76-5	mg/Kg	630	NC	NA	NA	NA	NA	ND(<0.0445)	0.0515
2,4,5-TP (Silvex)	93-72-1	mg/Kg	510	NC	NA	NA	NA	NA	ND(<0.0229)	0.0265

2011 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SS55C 9/8/2011	SS56B 9/8/2011	SS60A 9/8/2011	SSIP 9/8/2011	SS57A 9/8/2011	SS57A FD 9/8/2011
2,4-D	94-75-7	mg/Kg	700	NC	NA	NA	NA	NA	ND(<0.09)	0.104
2,4-DB	94-82-6	mg/Kg	510	NC	NA	NA	NA	NA	ND(<0.09)	0.104
Dinoseb	88-85-7	mg/Kg	63	NC	NA	NA	NA	NA	ND(<0.09)	0.104
Pentachlorophenol	87-86-5	mg/Kg	1	NC	NA	NA	NA	NA	ND(<0.0445)	ND(<0.0515)
PCBs										
Aroclor 1016	12674-11-2	mg/Kg	5.5	NC	NA	NA	NA	ND(<0.0454)	NA	NA
Aroclor 1221	11104-28-2	mg/Kg	0.26	NC	NA	NA	NA	ND(<0.0454)	NA	NA
Aroclor 1232	11141-16-5	mg/Kg	0.22	NC	NA	NA	NA	ND(<0.0454)	NA	NA
Aroclor 1242	53469-21-9	mg/Kg	0.31	NC	NA	NA	NA	ND(<0.0454)	NA	NA
Aroclor 1248	12672-29-6	mg/Kg	0.31	NC	NA	NA	NA	ND(<0.0454)	NA	NA
Aroclor 1254	11097-69-1	mg/Kg	0.32	NC	NA	NA	NA	ND(<0.0454)	NA	NA
Aroclor 1260	11096-82-5	mg/Kg	0.33	NC	NA	NA	NA	ND(<0.0454)	NA	NA

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Lev

Bold: Indicates concentration is above the Site Spesific Stndard Screening Level for Recreator Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-B

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, T

NC - Not calculated

NA - Not applicable

mg/Kg - Milligrams per kilogram

2018 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS No.	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SB 1 12/6/2018	SB 2 12/6/2018	SB 3 12/6/2018	SB 4 12/6/2018	SB 5 12/6/2018	SB 6 12/6/2018	SB 7 12/6/2018	SB 8 12/6/2018	SB 9 12/6/2018	SB 10 12/6/2018
Arsenic	7440-38-2	mg/Kg	0.43	16.9	19.5	61.2	17.9	10.9	34.9	47.6	17.7	80.6	29.4	18.4
Lead	7439-92-1	mg/Kg	400	NC	23.6	55.6	20	15.7	32.2	21.9	19.9	33.8	30.4	23.2
TPH		mg/Kg	NE	NC	182	202	54.6	81.7	70.1	67.3	20.8	66.8	64.9	102
Anthracene	120-12-7	mg/Kg	23000	NC	0.276	0.563	0.0642	0.18	0.163	0.0389	0.612	0.0963	0.162	0.173
Acenaphthene	83-32-9	mg/Kg	4100	NC	0.0418	0.0306	0.00762	0.0156	0.0143	0.00333	0.0469	0.00667	0.0152	0.0147
Acenaphthylene	208-96-8	mg/Kg	4200	NC	0.276	0.623	0.0553	0.176	0.109	0.0413	0.509	0.0677	0.142	0.22
Benzo(a)anthracene	56-55-3	mg/Kg	0.21	28.3	0.963	3.7	0.248	0.939	0.547	0.105	3.09	0.203	0.642	0.673
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	1.24	3.89	0.334	0.979	0.614	0.0965	3.82	0.233	0.705	1.08
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	2.26	7.62	0.738	1.93	1.18	0.18	7.18	0.463	1.41	2
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	1.25	2.86	0.285	0.716	0.484	0.0642	2.79	0.19	0.556	1.05
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	0.637	2.46	0.212	0.536	0.405	0.0586	2.26	0.133	0.397	0.6
Chrysene	218-01-9	mg/Kg	16	2870	1.15	3.86	0.354	1	0.633	0.152	3.12	0.277	0.774	0.91
Dibenzo(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	0.302	0.819	0.0695	0.196	0.158	0.0193	0.765	0.0537	0.165	0.237
Fluoranthene	206-44-0	mg/Kg	2400	NC	1.53	4.13	0.351	1.13	0.779	0.273	3.69	0.293	0.89	0.803
Fluorene	86-73-7	mg/Kg	2900	NC	0.0518	0.0386	0.00861	0.024	0.0189	0.00732	0.0505	0.0137	0.0242	0.023
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	1.63	4.13	0.401	1.04	0.683	0.0945	3.96	0.25	0.781	1.31
Naphthalene	91-20-3	mg/Kg	4.1	NC	0.121	0.112	0.0414	0.0503	0.0481	0.00899	0.126	0.0517	0.113	0.0437
Phenanthrene	85-01-8	mg/Kg	23000	NC	0.385	0.446	0.0838	0.161	0.144	0.0632	0.515	0.155	0.242	0.14
Pyrene	129-00-0	mg/Kg	2300	NC	1.41	4.43	0.358	1.26	0.756	0.22	3.92	0.287	0.874	0.856

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Level for Residential Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-Based Remedies, RBR Consulting, Beaver Falls, PA, April 2012, Table 2-2

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, Triad Engineering, Inc. 219 Hartman Run Road, Morgantown, WV, November 2011

NA - Not applicable

mg/Kg - Milligrams per kilogram

2018 Soil Analytical Results
Cheat River Trail - Preston County, West Virginia

Parameter	CAS No.	Units	WV De Minimus Screening Level (mg/kg)	Site Specific Standard Recreator Screening Level (mg/kg)	SB 11 12/6/2018	SB 12 12/6/2018	SB 13 12/6/2018	SB 14 12/6/2018	SB 15 12/6/2018
Arsenic	7440-38-2	mg/Kg	0.43	16.9	8.41	21.2	13.9	11.4	9.2
Lead	7439-92-1	mg/Kg	400	NC	17.9	23.1	9.71	24.1	14.1
TPH		mg/Kg	NE	NC	55.3	74.8	50.1	162	100
Anthracene	120-12-7	mg/Kg	23000	NC	0.133	0.12	0.502	0.0971	0.199
Acenaphthene	83-32-9	mg/Kg	4100	NC	0.00866	0.00961	0.026	0.00665	0.0455
Acenaphthylene	208-96-8	mg/Kg	4200	NC	0.116	0.111	0.423	0.0808	0.165
Benzo(a)anthracene	205-99-2	mg/Kg	0.16	28.3	0.213	0.302	1.56	0.193	0.518
Benzo(a)pyrene	50-32-8	mg/Kg	0.016	2.87	0.296	0.404	2.3	0.246	0.645
Benzo(b)fluoranthene	205-99-2	mg/Kg	0.16	28.7	0.639	0.865	4.93	0.459	1.3
Benzo(g,h,i)perylene	191-24-2	mg/Kg	1800	NC	0.323	0.351	1.93	0.206	0.581
Benzo(k)fluoranthene	207-08-9	mg/Kg	1.6	287	0.162	0.245	1.51	0.119	0.346
Chrysene	218-01-9	mg/Kg	16	2870	0.35	0.388	1.33	0.213	0.588
Dibenzo(a,h)anthracene	53-70-3	mg/Kg	0.016	2.87	0.0832	0.0941	0.486	0.0555	0.165
Fluoranthene	206-44-0	mg/Kg	2400	NC	0.393	0.398	1.93	0.223	0.671
Fluorene	86-73-7	mg/Kg	2900	NC	0.0153	0.0136	0.0386	0.0123	0.0425
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.16	28.7	0.409	0.504	2.66	0.286	0.824
Naphthalene	91-20-3	mg/Kg	4.1	NC	0.021	0.0441	0.12	0.0273	0.138
Phenanthrene	85-01-8	mg/Kg	23000	NC	0.105	0.0974	0.323	0.0705	0.316
Pyrene	129-00-0	mg/Kg	2300	NC	0.36	0.428	2.3	0.236	0.628

Notes:

Bold: Indicates concentration is above the WVDEP 60CSR3 Table 60-3B De Minimis Screening Level for Residential Soil

1) Human Health Risk Assessment for the Cheat River Trail, Preston County, West Virginia, Risk-Based Remedies, RBR Consulting, Beaver Falls, PA, April 2012, Table 2-2

2) Phase II Environmental Site Assessment Report, Cheat River Trail, ACRES EPA Site ID:113282, Triad Engineering, Inc. 219 Hartman Run Road, Morgantown, WV, November 2011

NA - Not applicable

mg/Kg - Milligrams per kilogram

Appendix B
Regional Screening Level On-Line Calculator Output

Appendix B
Site-Specific
Recreator Soil/Sediment Inputs

Variable	Form-input Value
ED_{rec} (exposure duration - recreator) years	26
ED_{rec-c} (exposure duration - child) years	6
BW_{rec-a} (body weight - adult) kg	80
BW_{rec-c} (body weight - child) kg	15
SA_{rec-a} (skin surface area - adult) cm^2/day	6032
SA_{rec-c} (skin surface area - child) cm^2/day	2373
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.000001
LT (lifetime - recreator) years	70
IRS_{rec-a} (soil intake rate - adult) mg/day	100
IRS_{rec-c} (soil intake rate - child) mg/day	200
AF_{rec-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{rec-c} (skin adherence factor - child) mg/cm^2	0.2
$IFS_{rec-adj}$ (age-adjusted soil ingestion factor) mg/kg	1470
$DFS_{rec-adj}$ (age-adjusted soil dermal factor) mg/kg	4135.6
$IFSM_{rec-adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	6673.333
$DFSM_{rec-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	17130.4
AF_{0-2} (skin adherence factor) mg/cm^2	0.2
AF_{2-6} (skin adherence factor) mg/cm^2	0.2
AF_{6-16} (skin adherence factor) mg/cm^2	0.07
AF_{16-30} (skin adherence factor) mg/cm^2	0.07
BW_{0-2} (body weight) kg	15
BW_{2-6} (body weight) kg	15
BW_{6-16} (body weight) kg	80
BW_{16-30} (body weight) kg	80
ED_{0-2} (exposure duration) year	2
ED_{2-6} (exposure duration) year	4
ED_{6-16} (exposure duration) year	10
ED_{16-30} (exposure duration) year	10
EF_{rec} (exposure frequency) days/year	14
EF_{rec-c} (exposure frequency - child) days/year	14
EF_{rec-a} (exposure frequency - adult) days/year	14
EF_{0-2} (exposure frequency) days/year	14
EF_{2-6} (exposure frequency) days/year	14
EF_{6-16} (exposure frequency) days/year	14
EF_{16-30} (exposure frequency) days/year	14
ET_{rec} (exposure time - recreator) hours/day	24
ET_{rec-c} (child exposure time) hours/day	24
ET_{rec-a} (adult exposure time) hours/day	24
ET_{0-2} (exposure time) hours/day	24
ET_{2-6} (exposure time) hours/day	24
ET_{6-16} (exposure time) hours/day	24
ET_{16-30} (exposure time) hours/day	24

Variable	Form-input Value
IRS_{0-2} (soil intake rate) mg/day	200
IRS_{2-6} (soil intake rate) mg/day	200
IRS_{6-16} (soil intake rate) mg/day	100
IRS_{16-30} (soil intake rate) mg/day	100
SA_{0-2} (skin surface area) cm^2/day	2373
SA_{2-6} (skin surface area) cm^2/day	2373
SA_{6-16} (skin surface area) cm^2/day	6032
SA_{16-30} (skin surface area) cm^2/day	6032
AT_{rec} (averaging time)	365
City (PEF Climate Zone) Selection	Default
A_s (PEF acres)	0.5
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77
PEF (particulate emission factor) m^3/kg	1359344438
A (PEF Dispersion Constant)	16.2302
B (PEF Dispersion Constant)	18.7762
C (PEF Dispersion Constant)	216.108
V (fraction of vegetative cover) unitless	0.5
U_m (mean annual wind speed) m/s	4.69
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.194
City (VF Climate Zone) Selection	Default
A_s (VF acres)	0.5
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.911
B (VF Dispersion Constant)	18.4385
C (VF Dispersion Constant)	209.7845
City (VF mass-loading Climate Zone) Selection	Default
Q/C_{vol} (g/m^2-s per kg/m^3 - mass limit)	68.18
A_s (VF mass-limit acres)	0.5
T (exposure interval) yr	26
p_b (dry soil bulk density - mass limit) g/cm^3	1.5
A (VF Dispersion Constant - mass limit)	11.911
B (VF Dispersion Constant - mass limit)	18.4385
C (VF Dispersion Constant - mass limit)	209.7845
T_w (groundwater temperature) Celsius	25

* Inputted values different from Recreator defaults are highlighted.

Appendix B Site-Specific

Recreator Regional Screening Levels (RSL) for Soil/Sediment

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Mutagen?	VOC?	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	SF_o(mg/kg-day)$^{-1}$	SF_oRef	IUR $(ug/m^3)^{-1}$	IUR Ref	ABS_{derm}	ABS_{gi}	Volatilization Factor (m^3/kg)	K_d (cm^3/g)	K_{oc} (cm^3/g)	Particulate Emission Factor (m^3/kg)
Arsenic, Inorganic	7440-38-2	No	No	3.00E-04	IRIS	1.50E-05	CALEPA	1.50E+00	IRIS	4.30E-03	IRIS	3.00E-02	1.00E+00	-	2.90E+01	-	1.36E+09
Benz[a]anthracene	56-55-3	Yes	Yes	-		-		1.00E-01	EPA/RPF	6.00E-05	EPA/RPF	1.30E-01	1.00E+00	4.41E+06	1.06E+03	1.77E+05	1.36E+09
Benzo[a]pyrene	50-32-8	Yes	No	3.00E-04	IRIS	2.00E-06	IRIS	1.00E+00	IRIS	6.00E-04	IRIS	1.30E-01	1.00E+00	-	-	5.87E+05	1.36E+09
Benzo[b]fluoranthene	205-99-2	Yes	No	-		-		1.00E-01	EPA/RPF	6.00E-05	EPA/RPF	1.30E-01	1.00E+00	-	-	5.99E+05	1.36E+09
Benzo[k]fluoranthene	207-08-9	Yes	No	-		-		1.00E-02	EPA/RPF	6.00E-06	EPA/RPF	1.30E-01	1.00E+00	-	-	5.87E+05	1.36E+09
Chrysene	218-01-9	Yes	No	-		-		1.00E-03	EPA/RPF	6.00E-07	EPA/RPF	1.30E-01	1.00E+00	-	-	1.81E+05	1.36E+09
Dibenz[a,h]anthracene	53-70-3	Yes	No	-		-		1.00E+00	EPA/RPF	6.00E-04	EPA/RPF	1.30E-01	1.00E+00	-	-	1.91E+06	1.36E+09
Indeno[1,2,3-cd]pyrene	193-39-5	Yes	No	-		-		1.00E-01	EPA/RPF	6.00E-05	EPA/RPF	1.30E-01	1.00E+00	-	-	1.95E+06	1.36E+09

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Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	DA	Soil Saturation Concentration (mg/kg)	Solubility (mg/L)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)
Arsenic, Inorganic	7440-38-2	-	-	-	6.00E-01	-	-		-	8.88E+02	PHYSPROP	1.67E+03	CRC89	-	-
Benz[a]anthracene	56-55-3	6.83E-10	-	9.40E-03	1.00E+00	1.20E-05	4.91E-04	PHYSPROP	4.91E-04	7.11E+02	PHYSPROP	9.79E+02	YAWS	2.61E-02	6.75E-06
Benzo[a]pyrene	50-32-8	-	-	1.62E-03	1.00E+00	4.57E-07	1.87E-05	PHYSPROP	1.87E-05	7.68E+02	PHYSPROP	9.69E+02	EPA 2001 Fact Sheet	2.55E-02	6.58E-06
Benzo[b]fluoranthene	205-99-2	-	-	1.50E-03	1.00E+00	6.57E-07	2.69E-05	PHYSPROP	2.69E-05	7.16E+02	EPI	9.69E+02	EPA 2001 Fact Sheet	2.50E-02	6.43E-06
Benzo[k]fluoranthene	207-08-9	-	-	8.00E-04	1.00E+00	5.84E-07	2.39E-05	PHYSPROP	2.39E-05	7.53E+02	PHYSPROP	1.02E+03	EPA 2001 Fact Sheet	2.50E-02	6.43E-06
Chrysene	218-01-9	-	-	2.00E-03	1.00E+00	5.23E-06	2.14E-04	PHYSPROP	2.14E-04	7.21E+02	PHYSPROP	9.79E+02	YAWS	2.61E-02	6.75E-06
Dibenz[a,h]anthracene	53-70-3	-	-	2.49E-03	1.00E+00	1.41E-07	5.76E-06	EPI	5.76E-06	7.97E+02	PHYSPROP	9.90E+02	EPA 2001 Fact Sheet	2.36E-02	6.02E-06
Indeno[1,2,3-cd]pyrene	193-39-5	-	-	1.90E-04	1.00E+00	3.48E-07	1.42E-05	PHYSPROP	1.42E-05	8.09E+02	PHYSPROP	1.08E+03	EPA 2001 Fact Sheet	2.47E-02	6.37E-06

Appendix B Site-Specific

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Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Child Ingestion SL HQ=1 (mg/kg)	Child Dermal SL HQ=1 (mg/kg)	Child Inhalation SL HQ=1 (mg/kg)	Noncarcinogenic Child SL HI=1 (mg/kg)	Adult Ingestion SL HQ=1 (mg/kg)	Adult Dermal SL HQ=1 (mg/kg)	Adult Inhalation SL HQ=1 (mg/kg)	Noncarcinogenic Adult SL HI=1 (mg/kg)	Adjusted Ingestion SL HQ=1 (mg/kg)
Arsenic, Inorganic	7440-38-2	1.93E+01	1.37E+02	2.22E+04	1.69E+01	9.78E+02	8.24E+03	5.32E+05	8.73E+02	1.04E+04	4.94E+04	5.32E+05	8.47E+03	3.23E+03
Benz[a]anthracene	56-55-3	3.83E+01	1.15E+02	1.86E+03	2.83E+01	-	-	-	-	-	-	-	-	-
Benzo[a]pyrene	50-32-8	3.83E+00	1.15E+01	5.74E+04	2.87E+00	5.87E+02	1.90E+03	7.09E+04	4.45E+02	6.26E+03	1.14E+04	7.09E+04	3.82E+03	1.94E+03
Benzo[b]fluoranthene	205-99-2	3.83E+01	1.15E+02	5.74E+05	2.87E+01	-	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	207-08-9	3.83E+02	1.15E+03	5.74E+06	2.87E+02	-	-	-	-	-	-	-	-	-
Chrysene	218-01-9	3.83E+03	1.15E+04	5.74E+07	2.87E+03	-	-	-	-	-	-	-	-	-
Dibenz[a,h]anthracene	53-70-3	3.83E+00	1.15E+01	5.74E+04	2.87E+00	-	-	-	-	-	-	-	-	-
Indeno[1,2,3-cd]pyrene	193-39-5	3.83E+01	1.15E+02	5.74E+05	2.87E+01	-	-	-	-	-	-	-	-	-

Appendix B Site-Specific

Recreator Regional Screening Levels (RSL) for Soil/Sediment

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Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Adjusted Dermal SL HQ=1 (mg/kg)	Adjusted Inhalation SL HQ=1 (mg/kg)	Noncarcinogenic Adjusted SL HI=1 (mg/kg)	Screening Level (mg/kg)
Arsenic, Inorganic	7440-38-2	2.29E+04	5.32E+05	2.81E+03	1.69E+01
Benz[a]anthracene	56-55-3	-	-	-	2.83E+01
Benzo[a]pyrene	50-32-8	5.30E+03	7.09E+04	1.39E+03	2.87E+00
Benzo[b]fluoranthene	205-99-2	-	-	-	2.87E+01
Benzo[k]fluoranthene	207-08-9	-	-	-	2.87E+02
Chrysene	218-01-9	-	-	-	2.87E+03
Dibenz[a,h]anthracene	53-70-3	-	-	-	2.87E+00
Indeno[1,2,3-cd]pyrene	193-39-5	-	-	-	2.87E+01

Appendix C

Laboratory Quality Assurance Manual

Document Information

Document Number: ÛÒÊƠÓßÒƟÞÛßÊœðð ðï **Revision:** ðï

Document Title: Ï «¿´·§Ó¿² «¿´

Department(s): Ï «¿´·§

Date Information

Effective Date: ðí ß°®î ðî ð

Notes

Document Notes:

All Dates and Times are listed in: Ý»² ¬®´Ì ·³ » Æ±² »

Signature Manifest

Document Number: ENV-MAN-BEAV-0001 **Revision:** 01

Title: Quality Manual

All dates and times are in Central Time Zone.

ENV-MAN-BEAV-0001

QM Approval

Name/Signature	Title	Date	Meaning/Reason
Lisa Eads (007015)	Manager - Quality	02 Apr 2020, 03:17:55 PM	Approved

Management Approval

Name/Signature	Title	Date	Meaning/Reason
Lisa Eads (007015)	Manager - Quality	02 Apr 2020, 03:18:06 PM	Approved
Richard Clinkscales (990506)	General Manager 1	02 Apr 2020, 03:23:34 PM	Approved
Joshua Cox (007008)	Supervisor	02 Apr 2020, 03:23:50 PM	Approved
Nellie Cooper (007006)	Supervisor	02 Apr 2020, 03:34:04 PM	Approved
Ed Kirk (007048)	Manager	02 Apr 2020, 03:47:49 PM	Approved
Colin Walters (005945)	Regional Director - Operations	02 Apr 2020, 03:54:16 PM	Approved
Jackie Jones Jr (007044)	Supervisor	03 Apr 2020, 05:41:15 AM	Approved
Alexa Hammond (007641)	Supervisor	03 Apr 2020, 09:30:54 AM	Approved
Michael Hofe (007039)	Manager	03 Apr 2020, 11:09:59 AM	Approved

TITLE PAGE

LABORATORY QUALITY MANUAL

Prepared for:

Pace Analytical Services, LLC
225 Industrial Park Road
Beaver, WV 25813
Phone: 304-255-2500
(AKA: Pace West Virginia)

Pace Analytical Services, LLC
782 N. Lee Highway
Lexington, VA 24450
Phone: 540-464-1880

Pace Analytical Services, LLC
16 Commerce Drive
Westover, WV 26501
Phone: 304-241-5861

Manual Approval Signatories

Approval of this manual by managerial personnel is recorded on the Signature Manifest located before the Title Page of this manual.

The individuals listed below represent the management team that was in place on the effective date of this version of the manual for the following location:

Pace Analytical Services, LLC
225 Industrial Park Road
Beaver, WV 25813
Phone: 304-255-2500

Each of the following individuals is a signatory for the manual for the location listed above. The application of their signature to the manual signifies their commitment to communicate, implement, and uphold the requirements, policies and procedures specified in this manual and their commitment to continuously improve the effectiveness of the quality management system based on customer feedback and internal assessment.

Name[1]	Title	Address[2]	Phone[2]
Colin Walters	Senior General Manager	1638 Roseytown Rd, Greensburg, PA 15601	724-433-5223
Richard Clinkscales[3]	General Manager		
Lisa Eads	Quality Manager		
Brian Richards	Operations Manager	5 Weatheridge Drive, Hurricane, WV 25526	304-964-4142
Michael Hofe	Client Services Manager		
Lisa Eads/Luke Harvey	Health & Safety, however named		
Angie Robertson	IT Manager		
Josh Cox	Volatiles Department Manager		
Nellie Cooper	Semi-Volatiles Department Manager		
Alexa Hammond	Metals Department Supervisor		
Jay Jones	Wet Chemistry Department Manager		
Ed Kirk[3]	Biological Department Manager		
Tim Keeney	Geological Department Manager		
Andrea Crone	Sample Custody Supervisor		
Blane Williams	Courier Supervisor		

[1] Members of the local management team are subject to change during the life-cycle of this document version.
[2] Include if different from the physical address and phone number of the facility.
[3]This individual serves as an Acting Technical Manager for TNI for one or more fields of accreditation.

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782 N. Lee Highway
Lexington, VA 24450
Phone: 540-464-1880

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Richard Clinkscales [3]	General Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Lisa Eads	Quality Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Michael Hofe	Client Services Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Lisa Eads	Health & Safety, however named	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Angie Robertson	IT Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Matthew Vess [3]	Service Center Supervisor		

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Pace Analytical Services, LLC
16 Commerce Drive
Westover, WV 26501
Phone: 304-241-5861

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Richard Clinkscales	General Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Lisa Eads	Quality Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Michael Hofe	Client Services Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Lisa Eads	Health & Safety, however named	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
Angie Robertson	IT Manager	225 Industrial Park Rd, Beaver, WV 25813	304-255-2500
John McGee	Service Center Supervisor		

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Table of Contents

1.0 PURPOSE AND SCOPE

1.1 Purpose

This quality manual (manual) outlines the quality management system and management structure of the laboratories and service centers affiliated with Pace Analytical Services, LLC (PAS). A laboratory is defined by PAS as any PAS facility, however named, that provides testing, sampling, or field measurement services. When the term 'laboratory" is used in this manual, the term refers to all locations listed on the Title Page of this manual and in Section 4.1.3 unless otherwise specified.

The PAS quality management system is also referred to as the quality program throughout this document. In this context, the phrase "quality management system" and "quality program" are synonymous.

The quality management system is the collection of policies and processes established by PAS management to consistently meet customer requirements and expectations, and to achieve the goals to provide PAS customers with high quality, cost-effective, analytical measurements and services.

The quality management system is also intended to establish conformance[1] and compliance with the current versions of the following international and national quality system standards:

- ISO/IEC 17025: *General requirements for the competence of testing and calibration laboratories*
- NELAC/TNI Standard Volume 1: *Management and Technical Requirements for Laboratories Performing Environmental Analysis*

[1]The statement of conformity to these Standards pertains only to testing and sampling activities carried out by the laboratory at its physical address, in temporary or mobile facilities, in-network, or by laboratory personnel at a customer's facility.

In addition to the international and national standards, the quality management system is designed to achieve regulatory compliance with the various federal and state programs for which the laboratory provides compliance testing and/or holds certification or accreditation. When federal or state requirements do not apply to all PAS locations, the requirements for compliance are provided in addendum to this manual or in other documents that supplement the manual. Customer-specific project and program requirements are not included in the manual in order to maintain client confidentiality.

- A list of accreditation and certifications held by each laboratory associated with this manual is provided in Appendix A.
- A list of analytical testing capabilities offered by each laboratory associated with this manual is provided in Appendix B.

1.2 Scope and Application

This manual applies to each of the PAS locations listed on the Title Page and in Section 4.1.3.

The manual was prepared from a quality manual template (template) created by PAS corporate quality personnel. The template outlines the minimum requirements PAS management considers necessary for every PAS laboratory, regardless of scope of services or number of personnel, to establish in order to maintain a quality management system that achieves the objectives of PAS's Quality Policy (See 4.2.2). In this regard, the template is the mechanism used by the corporate officers (a.k.a. 'top management') to communicate their expectations and commitment for the PAS quality program to all PAS personnel.

The laboratory also has the responsibility to comply with federal and state regulatory and program requirements for which it provides analytical services and holds certification or accreditation. When those requirements are more stringent than the template, the requirements for compliance are provided in addendum to this manual or in other documents that supplement the manual. This document structure maintains consistency in the presentation of the quality management system across the network while providing the laboratory a mechanism to describe and achieve compliance requirements on a program basis.

1.2.1 Quality Manual Template

The quality manual template is developed by the Corporate Quality Director with contribution and input from corporate quality personnel and the corporate officers. Approval of the template by the corporate officers (aka "top management") confirms their commitment to develop and maintain a quality management system appropriate for the analytical services offered by the organization and to communicate their expectations of the quality program to all personnel.

The template and instructions for use of the template are released by corporate quality personnel to quality assurance manager(s) responsible for each laboratory (Local QA). Local QA uses the template to prepare the laboratory's manual by following the instructions provided. Since the template provides the minimum requirements by which all PAS locations must abide, the laboratory may not alter the font, structure or content of the template except where specified by instruction to do so. As previously stated, program specific requirements are provided in addendum or in documents that supplement this manual.

The template is reviewed by corporate quality personnel every two years and updated if needed. More frequent review and revision may be necessary to manage change, to maintain conformance and compliance to relevant standards, or to meet customer expectations.

See standard operating procedure (SOP) ENV-SOP-CORQ-0015 *Document Management and Control* for more information.

1.2.2 Laboratory Quality Manual

The manual is approved and released to personnel under the authority of local management. The manual is reviewed annually and location specific information is updated, if needed. More frequent review and revision may be necessary when there are significant changes to the organizational structure, capabilities, and resources of the laboratory. Review and revision of the manual is overseen by local QA. If review indicates changes to the main body of the manual are necessary to maintain conformance and compliance to relevant standards, or to meet customer expectations, local QA will notify corporate quality personnel to initiate review and/or revision of the template.

See SOP ENV-SOP-CORQ-0015 *Document Management and Control* for more information.

1.2.3 References to Supporting Documents

The template and the manual includes references to other laboratory documents that support the quality management system such as policies and standard operating procedures (SOPs). These references include the document's document control number and may include the document title.

This information is subject to change. For example, an SOP may be converted to a policy or the document's title may change. For these types of administrative changes, the manual and template are updated to reflect the editorial change during the document's next scheduled review/revision cycle or the next time a new version of the document is released, whichever is sooner.

Local QA maintains a current list of controlled documents used at each PAS location to support the quality management system. This list, known as the Master List, lists each document used by document control number, title, version, effective date, and reference to any document(s) that the current version supersedes. When there is a difference between the template and/or manual and the Master List, the document information in the Master List takes precedence. The current Master List is readily available to personnel for their use and cross-reference. Parties external to the laboratory should contact the laboratory for the most current version.

2.0 REFERENCES

References used to prepare this manual include:

- "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.
- "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.
- "Methods for Chemical Analysis of Water and Wastes", EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.
- U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis, current version.
- U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, current version.
- "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.
- "Annual Book of ASTM Standards", Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.
- "Annual Book of ASTM Standards", Section 11: Water and Environmental Technology, American Society of Testing and Materials.
- "NIOSH Manual of Analytical Methods", U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.
- "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water", U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).
- Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.
- Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.
- Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February, 1992.
- Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July, 1990.

- Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.
- National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.
- ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

  The following are implemented by normative reference to ISO/IEC 17025:

  - ISO/IEC Guide 99, *International vocabulary of metrology –Basic and general concepts and associated terms*
  - ISO/IEC 17000, *Conformity assessment – Vocabulary and general principles*
- Department of Defense Quality Systems Manual (QSM), most current version.
- TNI (The NELAC Institute) Standard- most current version applicable to each lab.
- UCMR Laboratory Approval Requirements and Information Document, most current version.
- US EPA Drinking Water Manual, most current version.

3.0 TERMS AND DEFINITIONS

Refer to Appendix C for terms, acronyms, and definitions used in this manual and in other documents used by the laboratory to support the quality management system.

4.0 MANAGEMENT REQUIREMENTS

4.1 Organization

4.1.1 Legal Identity

Pace Analytical Services, LLC is authorized under the State of Minnesota to do business as a limited liability company.

4.1.1.1 Change of Ownership

If there is a change of ownership, if a location goes out of business, or if the entire organization ceases to exist, Pace Analytical Services, LLC ensures that regulatory authorities are notified of the change within the time-frame required by each state agency for which the location is certified or accredited.

Requirements for records and other business information are addressed in the ownership transfer agreement or in accordance with appropriate regulatory requirements, whichever takes precedence.

4.1.2 Compliance Responsibility

Laboratory management has the responsibility and authority to establish and implement procedures and to maintain sufficient resources necessary to assure its activities are carried out in such a way to meet the compliance requirements of the quality management system.

4.1.3 Scope of the Quality Management System

The quality management system applies to work carried out at each location covered by this manual including permanent facilities, at sites away from its permanent facilities, or in associated temporary or mobile facilities.

The permanent and mobile facilities to which this manual applies includes:

Name	Pace Analytical Services, LLC
Address:	225 Industrial Park Road
City, State, Zip	Beaver, WV, 25813
Phone Number	304-255-2500
Service Type:	Laboratory

Name	Pace Analytical Services, LLC
Address:	782 N. Lee Highway
City, State, Zip	Lexington, VA 24450
Phone Number	540-464-1880
Service Type:	Laboratory

Name	Pace Analytical Services, LLC
Address:	16 Commerce Drive
City, State, Zip	Westover, WV 26501
Phone Number	304-241-5861
Service Type:	Laboratory

4.1.4 Organization History and Information

Founded in 1978, Pace Analytical Services, LLC (PAS) is a privately held scientific services firm operating one of the largest full service contract laboratory and service center networks in the United States. The company's network offer inorganic, organic and radiochemistry testing capabilities; specializing in the analysis of trace level contamination in air, drinking water, groundwater, wastewater, soil, biota, and waste.

With over 90 laboratories and services centers in the contiguous US and in Puerto Rico, the network provides project support for thousands of industry, consulting, engineering and government professionals.

Pace delivers the highest standard of testing and scientific services in the market. We offer the most advanced solutions in the industry, backed by truly transparent data, a highly trained team, and the service and support that comes from four decades of experience.

4.1.4.1 Organization Structure

Each location maintains a local management structure under the oversight and guidance of corporate personnel. Local management is responsible for making day-to-day decisions regarding the operations of the facility, implementing the quality management system, upholding the requirements of the quality program, and for supervision of personnel.

Local management is provided by a General Manager (GM) or Assistant (AGM), Quality Manager (QM), Client Services Manager (CSM), Information Technology (IT) Manager, Department Managers (DM) and/or Department Supervisors (DS), however named.

Some locations may also have any one of the following management positions: Senior Quality Manager (SQM), Operations Manager (OM), Technical Director (TD), or Technical Manager (TM). When the location does not have a TD or TM, technical management is provided jointly by the GM, QM, DM, and DS.

The GM (or AGM), however named reports to a Senior General Manager (SGM), who is responsible for the management of multiple laboratories and service centers within a geographical region, and who reports directly to the Chief Operating Officer (COO). The QM and SQM have indirect reporting relationship to the Corporate Director of Quality.

Refer to the organization charts provided in Appendix D to view the management structure, reporting relationships, and the interrelationships between positions.

4.1.5 Management Requirements

4.1.5.1 Personnel

The laboratory is staffed with administrative and technical personnel who perform and verify work under the supervision of managerial personnel.

- Technical personnel include analysts and technicians that generate or contribute to the generation of analytical data and managerial personnel that oversee day to day supervision of laboratory operations. Including the reporting of analytical data and results, monitoring QA/QC performance, and monitoring the validity of analysis to maintain data integrity and reliability.
- Administrative personnel support the day-to-day activities of the laboratory.
- IT personnel maintain the information technology systems and software used at the laboratory.
- Client services personnel include project managers and support staff that manage projects.
- Managerial personnel make day-to-day and longer term decisions regarding the operations of the facility, supervise personnel, implement the quality management system and uphold the requirements of the quality program.

All personnel regardless of responsibilities are expected to carry out their duties in accordance with the policies and processes outlined in this manual and in accordance with standard operating procedures (SOPs) and other quality system documents. The laboratory's policies and procedures are designed for impartiality and integrity. When these procedures are fully implemented, personnel remain free from undue pressure and other influences that adversely impact the quality of their work or data.

4.1.5.1.1 Key Personnel

Key personnel include the management positions that have the authority and responsibility to plan, direct, and control, activities of the division (corporate) or the laboratory.

The following tables list key personnel positions by PAS job title and the position's primary deputy:

Key Personnel: Corporate

Key Personnel	Primary Deputy
Chief Executive Officer	Chief Operating Officer
Chief Operating Officer	Chief Executive Officer
Chief Compliance Officer	Quality Director
Corporate Quality Director	Chief Compliance Officer
Health and Safety Director	Chief Compliance Officer
IT Director	LIMS Administrator, however named.

Key Personnel: Laboratory

Key Personnel	Primary Deputy
Senior General Manager	Chief Operating Officer or as designated.
General Manager / Assistant GM	Senior General Manager
Quality Manager	Corporate Quality Manager or as designated.
Client Services Manager	General Manager
Local IT	Corporate IT Director or as designated.
Department Manager	General Manager
Senior Quality Manager[1]	Corporate Quality Manager
Technical Director[1]/Manager[1] Acting Technical Manager TNI	Quality Manager
Operations Manager[1]	General Manager or Assistant GM.

[1] *Position may not be staffed at each location.*

Some state certification programs require the agency to be notified when there has been a change in key personnel. Program-specific requirements and time-frames for notification by agency, are tracked and upheld by local QA, when these requirements apply.

4.1.5.2 Roles and Responsibilities

The qualifications, duties, and responsibilities for each position are detailed in job descriptions maintained by PAS's corporate Human Resource's Department (HR).

The following summaries briefly identify the responsibility of key personnel positions in relation to the quality management system.

Chief Executive Officer (CEO): The CEO has overall responsibility for performance of the organization and endorses the quality program. Working with corporate and laboratory management, the CEO provides the leadership and resources necessary for PAS locations to achieve the goals and objectives of the quality management system and quality policy statement.

Chief Operating Officer (COO): The COO oversees all aspects of operations management including, strategic planning, budget, capital expenditure, and management of senior management personnel. In this capacity, the COO provides leadership and resources necessary to help top management at each PAS location achieve the goals and objectives of the quality management system and quality policy statement.

Chief Compliance Officer (CCO): The CCO oversees the quality assurance and environmental health and safety programs (HSE) for each business unit. The CCO is responsible for planning and policy development for these groups to ensure regulatory compliance and to manage risk. The position provides leadership and guidance necessary for all PAS locations to achieve the goals and objectives of the quality and HSE programs.

The CCO also serves as the Ethics Officer (ECO). The ECO develops the Ethics and Data Integrity Policy and Training Program, and provides oversight for reporting and investigation of ethical misconduct to maintain employee confidentiality during the process. The ECO provide guidance and instruction for follow-up actions necessary to remedy the situation and deter future recurrence.

Corporate Director of Quality: The Corporate Director of Quality is responsible for developing and maintaining the PAS quality program under guidance and assistance from the CEO, COO, and CCO. This position helps develop corporate quality policy and procedure and analyzes metric data and other performance indicators to assess and communicate the effectiveness of the quality program to top management. The position provides leadership and guidance for implementation of the quality program across all PAS locations.

Corporate Director of Information Technology: The Corporate Director of IT oversees the systems and processes of information technology used to support the quality program. These systems include Laboratory Information Management Systems (LIMS); data acquisition, reduction, and reporting software; virus-protection, communication tools, and ensuring the integrity and security of electronic data.

Senior General Manager (SGM): The SGM has full responsibility for administrative and operations management and performance of a group of PAS laboratories and service centers. Working with the COO and local laboratory management, the SGM provides leadership, guidance and resources, including allocation of personnel, necessary to achieve the goals of PAS quality program.

General Manager (GM) / Assistant General Manager (AGM): The GM or AGM is responsible for the overall performance and administrative and operations management of a PAS location and associated service center(s). This position is responsible to provide leadership and resources, including allocation and supervision of personnel, necessary for the location to implement and achieve the goals of the PAS quality program. In this capacity, the position assures laboratory personnel are trained on and understand the structure and components of the quality program defined in this manual as well as the policies and procedures in place to implement the quality management system.

The GM/AGM of NELAC/TNI Accredited laboratories are also responsible for the designation of technical personnel to serve as acting technical managers for TNI for the fields of accreditation held by the laboratory (See Section 4.1.5.2.2) and for notifying the accreditation body (AB) of any extended absence or reassignment of these designations.

Quality Manager (QM): The QM oversees and monitors implementation of the quality management system and communicates deviations to laboratory management. The QM is independent of the operation activities for which they provide oversight and has the authority to carry out the roles and responsibilities of their position without outside influence.

Additionally, in accordance with the TNI Standard, the QM:

- serves as the focal for QA/QC and oversees review of QC data for trend analysis;
- evaluates data objectively and perform assessments without outside influence;
- has document training and experience in QA/QC procedures and the laboratory's quality system;
- has a general knowledge of the analytical methods offered by the laboratory;
- coordinates and conducts internal systems and technical audits;
- notifies laboratory management of deficiencies in the quality system;
- monitors corrective actions;
- provides supports to technical personnel and may serve as the primary deputy for the acting TNI Technical Manager(s).

Client Services Manager (CSM): The CSM oversees project management personnel. This position is responsible for training and management of client facing staff that serve as the liaison between PAS and the customer to ensure that projects are successfully managed to meet the expectations and needs of PAS customers. This position is also responsible for sharing positive and negative customer feedback with laboratory management so that this information may be used to improve the quality program.

Local IT Manager, however named: Local IT managers are responsible for maintaining the IT systems used to support the quality program. These systems include Laboratory Information Management Systems (LIMS); data acquisition, reduction, and reporting software; virus-protection, communication tools, and ensuring the integrity and security of electronic data.

Department Manager (DM): The DM is responsible for administrative and operations management and implementation of the quality management system in the work area he/she oversees. These responsibilities include but are not limited to: training and supervision of personnel, monitoring work activity to maintain compliance with this manual, SOPs, policies and other instructional documents that support the quality management system; method development, validation and the

establishment and implementation of SOPs to assure regulatory compliance and suitability for intended purpose; monitoring QA/QC performance, proper handling and reporting of nonconforming work, purchasing of supplies and equipment adequate for use, maintaining instrumentation and equipment in proper working order and calibration, and general maintenance of administrative and technical processes and procedures established by the laboratory.

Senior Quality Manager (SQM): The SQM provides support to the quality manager and assists the quality manager with implementation of the quality management system for one or more site locations.

Technical Director (TD): The TD provides technical oversight and guidance to laboratory personnel. Responsibilities may include but are not limited to: research and development, method development and validation, development of standard operating procedures, proposal and contract review. The TD may also be responsible for QA/QC trend analysis, technical training, and technology improvement.

Operations Manager (OM): The OM is responsible for management of production and/or other duties assigned by the GM or SGM.

4.1.5.2.1 Acting Technical Manager (TNI Accreditation):

For PAS locations that are NELAC/TNI accredited:

The TNI Standard specifies requirements for the qualification and duties of technical personnel with managerial responsibility. These requirements are associated in the Standard to the designation 'technical manager(s), however named'. These responsibilities may be assigned to multiple individuals and are not associated with any specific job title.

For PAS, these TNI requirements for personnel that provide technical oversight correlate with PAS's job descriptions for Department Manager or Supervisor. However, the duties may be assigned to any PAS employee that meets the TNI specified qualifications.

Personnel assigned this designation retain their PAS assigned job title. The job title may be appended with *"acting as technical manager for TNI"* and the technology or field of accreditation for which the employee is approved, if necessary.

When TNI Accreditation Bodies (AB) refer to these employees as 'technical manager' or 'technical director' on the official certificate or the scope of accreditation, this reference is referring to their approval to carry out duties of the 'technical manager, however named' as specified in the TNI Standard.

In accordance with the TNI Standard, the acting Technical Manager(s) for TNI are responsible for monitoring the performance of QC/QA in the work areas they oversee.

If the absence of any employee that is approved as acting technical manager for TNI exceeds 15 calendar days, the duties and responsibilities specified in the TNI Standard are reassigned to another employee that meets the qualifications for the technology or field of accreditation or they are assigned to the position's deputy, the quality manager.

4.1.5.3 Conflict of Interest

A conflict of interest is a situation where a person has competing interests. Laboratory management looks for potential conflict of interest and undue pressures that might arise in work activities and then includes countermeasures in policies and procedures to mitigate or eliminate the conflict.

See policy COR-POL-0004 *Ethics Policy* for more information.

4.1.5.4 Confidentiality

Laboratory management is committed to preserving the confidentiality of PAS customers and confidentiality of business information.

Procedures used by the laboratory to maintain confidentiality include:

- A Confidentiality Agreement which all employees are required to sign at the time of employment and abide by the conditions of throughout employment;
- Record retention and disposal procedures that assure confidentiality is maintained;
- Physical access controls and encryption of electronic data; and
- Protocol for handling Confidential Business Information (CBI).

Client information obtained or created during work activities is considered confidential and is protected from intentional release to any person or entity other than the client or the client's authorized representative information provided to PAS, except when the laboratory is required by law to release confidential information to another party, such as a regulatory agency or for litigation purposes. In which case, the laboratory will notify the client of the release of information and the information provided.

The terms of client confidentiality are included in PAS Standard Terms and Conditions (T&C). With the acceptance of PAS Terms and Conditions and/or the implicit contract for analytical services that occurs when the client sends samples to the laboratory for testing, the client authorizes PAS to release confidential information when required.

See policy COR-POL-0004 *Ethics Policy* for more information.

4.1.5.5 Communication

Communication is defined as the imparting or exchanging of news and information. Effective (good) communication occurs when the person(s) you are exchanging information with actively gets the point and understands it.

4.1.5.5.1 Workplace Communication

Good communication in the workplace is necessary to assure work is done correctly, efficiently, and in accordance with client expectations.

Instructions for how to carry out work activities are communicated to personnel via written policy, standard operating procedures, and standard work instructions.

Information about laboratory performance (positive and negative) and ideas for improvement are communicated using various communication channels such as face to face meetings, video conferencing, conference calls, email, memoranda, written reports, and posters.

4.1.5.5.2 External Communication

Communication with external parties such as customers, vendors, business partners, and regulatory agencies takes place every day.

Laboratory management ensure personnel learn to communicate in professional and respectful ways in order to build strong relationships, and learn to communicate effectively to avoid misunderstanding.

4.2 Quality Management System

4.2.1 Quality Management System Objectives

The objectives of the laboratory's quality management system are to provide clients with consistent, exemplary professional service, and objective work product that is of known and documented quality that meets their requirements for data usability and regulatory compliance.

Objective work product is analytical services, data, test results, and information that is not influenced by personal feeling or opinions. The quality of being objective is also known as 'impartiality'.

4.2.1.1 Impartiality

The laboratory achieves and maintains impartiality by implementing and adhering to the policies and processes of the quality management system, which are based on industry accepted standards and methodologies.

The laboratory's procedures for handling nonconforming work (See 4.9), corrective and preventive actions (See 4.11) and management review (See 4.15) are the primary mechanisms used to identify risk to impartiality and to prompt actions necessary to eliminate or reduce the threat when risk to impartiality is suspected or confirmed.

4.2.1.2 Risk and Opportunity Assessment

Risks are variables that make achieving the goals and objectives of the quality management system uncertain. An opportunity is something that has potential positive consequences for the laboratory.

Laboratory personnel manage risks and opportunities on a daily basis by carrying out the processes that make up the quality management system. Some of the ways in which the quality management system is designed to identify, minimize, or eliminate risk on a daily basis include but are not limited to:

- Capability and capacity reviews of each analytical service request to assure the laboratory can meet the customer's requirements;
- Maintenance of accreditation and certification for test methods in multiple states and programs to cover a broad range of jurisdiction for regulatory compliance;
- SOPs and other controlled instructional documents are provided to personnel to eliminate variability in process. These documents include actions to counter risk factors inherent in the process and are reviewed on a regular basis for on-going suitability and relevancy;
- Participation in proficiency testing programs and auditing activities to verify on-going competency and comparability in performance;
- Provision of on-the-job training and established protocol for quality control (QC) corrective action for nonconforming events;
- An established program for ethics, and data integrity;
- Tiered data review process;
- Culture of continuous improvement;
- Monitoring activities to assess daily and long term performance; and
- Annual critical review of the effectiveness of the quality management system.

PAS also promotes a continuous improvement culture based on the principles of lean manufacturing. These principles include 3P (Process, Productivity, Performance) and Kaizen. 3P is a platform used by Pace to share best practices and standardization across the network to achieve operational excellence. Kaizen is a team based process used to implement tools and philosophies of lean to reduce waste and achieve flow with the purpose of improving both external and internal customer satisfaction. PAS's lean programs and activities help to mitigate risk because they generate a collective understanding of vulnerabilities and utilize group-effort to develop and implement solutions at all levels.

Risk and opportunities may also be formally identified using specific risk and opportunity assessment methods such as SWOT Analysis (Strength, Weakness, Opportunity, Threats) and 3-Stage Impact/Probability Grids.

4.2.1.3 Communication of the Quality Management System

This manual is the primary mechanism used by laboratory management to communicate the quality management system to laboratory personnel.

To assure personnel understand and implement the quality program outlined in the manual:

- All laboratory personnel are required to sign a Read and Acknowledgement Statement to confirm the employee has: 1) been informed of the manual by laboratory management, 2) has access to the manual, 3) has read the manual 4) understands the content of the manual, and 5) agrees to abide by the requirements, policies and procedures therein.
- Personnel are informed that the manual provides the "what" of the quality management system. The "how to" implementation of the quality management system is provided in policy, SOPs, standard work instructions, and other controlled instructional documents.

4.2.2 Quality Policy Statement

The quality policy of the laboratory is to provide customers with data of known and documented quality fit for their intended purpose. The laboratory achieves this policy by implementing the quality management system defined in this manual, by following industry accepted protocol for analytical testing and quality assurance and quality control (QA/QC) activities, by conformance with published and industry accepted testing methodologies, and by compliance with international and national standards for the competency and/or accreditation of testing laboratories.

Intrinsic to this policy statement is each of the following principles:

- The laboratory will provide customers with reliable, consistent, and professional service. This is accomplished by making sure the laboratory has the resources necessary to maintain capability and capacity; that staff are trained and competent to perform the tasks they are assigned; that client-facing staff are trained and prepared to find solutions to problems and to assist customers with their needs for analytical services. Customer feedback, both positive and negative, is shared with personnel and used to identify opportunities for improvement.
- The laboratory maintains a quality program that complies with applicable, state, federal, industry standards for analytical testing and competency.

  ISO/IEC 17025 and the TNI (The NELAC Institute) Standard is used by PAS to establish the minimum requirements of the PAS quality program.

  ISO/IEC 17025 is a competency standard that outlines the general requirements for the management system for calibration and testing laboratories. It is the primary quality system standard from which other quality system standards, such as the TNI Standard, are based. The TNI Standard are consensus standards that provides management and technical requirements for laboratories performing environmental analysis.
- Laboratory management provides training to personnel so that all personnel are familiar with the quality management system outlined in this manual and that they understand that implementation of the quality management system is achieved by adherence to the organization's policies and procedures.
- Laboratory management continuously evaluates and improves the effectiveness of the quality management system by responding to customer feedback, and other measures of performance, such as but not limited to: the results of

internal/external audits, proficiency testing, metrics, trend reports, and annual and periodic management reviews.

4.2.2.1 Ethics Policy / Data Integrity Program

PAS has established a comprehensive ethics and data integrity program that is communicated to all PAS employees in order that they understand what is expected of them. The program is designed to promote a mindset of ethical behavior and professional conduct that is applied to all work activities.

The key elements of the PAS Ethics / Data Integrity Program include:

- Ethics Policy (COR-POL-0004);
- Ethics Compliance Officer;
- Standardized data integrity training course taken by all new employees on hire and a yearly refresher data integrity training course for all existing employees;
- Policy Acknowledgement Statements that all PAS personnel, including contract and temporary, are required to sign at the time of employment and again during annual refresher training to document the employee's commitment and obligation to abide by the company's standards for ethics, data integrity and confidentiality;
- SOPs that provide instructions for how to carry out a test method or process to assure tasks are done correctly and consistently by each employee;
- On the Job Training;
- Data integrity monitoring activities which include, but are not limited to, secondary and tertiary data review, internal technical and system audits, raw data audits, data mining scans, and proficiency testing; and
- Confidential reporting process for alleged ethics and data integrity issues.

All laboratory managers are expected to provide a work environment where personnel feel safe and can report unethical or improper behavior in complete confidence without fear of retaliation. Retaliation against any employee that reports a concern is not tolerated.

PAS has engaged Lighthouse Services, Inc. to provide personnel with an anonymous reporting process available to them 24 hours a day/7 days per week. The alert line may be used by any employee to report possible violations of the company's ethics and data integrity program. When using the reporting process, the employee does need to specify the location of concern and when reporting by email, also include the company name. Messages are collected, documented, reviewed, and will be followed up on by the Ethics Compliance Officer to resolve the matter. Investigations concerning data integrity are kept confidential.

Lighthouse Compliance Alert Lines:

English Speaking US & Canada	(844) 940-0003
Spanish Speaking North America	(800) 216-1288

Internet	www/lighthouse-services.com/pacelabs
Email	reports@lighthouse-services.com

4.2.3 Management Commitment: Quality Management System

Evidence of management's commitment for the development, maintenance, and on-going improvement of the quality management system is provided by the application of their signature of approval to this manual. Their signature confirms they understand their responsibility to implement the quality management system outlined in this manual, to communicate the quality program to personnel, and to uphold requirements of the program during work activities.

4.2.4 Management Commitment: Customer Service

Management communicates the importance of meeting customer and regulatory requirements to personnel by training personnel on the quality management system outlined in this manual, implementing the quality management system outlined in this manual, and upholding these requirements for all work activities.

4.2.5 Supporting Procedures

Documents that support this manual and quality management system are referenced throughout this manual. The structure of the document management system is outlined in SOP ENV-SOP-CORQ-0015 *Document Management and Control* and summarized in the following subsections.

4.2.5.1 Quality Management System Document Structure

Documents associated with the quality management system are classified into document types that identify the purpose of the document and establish how the document is managed and controlled.

Document types are ranked to establish which documents takes precedence when there is an actual or perceived conflict between documents and to establish the hierarchal relationships between documents. The ranking system also provides information to document writers and reviewers to assure downline documents are in agreement with documents of higher rank. Project specific documents are not ranked because client specific requirements are not incorporated into general use documents in order to maintain client confidentiality.

PAS Quality Management System Documents: Internal

Document Type	Purpose
Quality Manual	Outlines the laboratory's quality management system and structure and how it works for a system including policy, goals, objectives and detailed explanation of the system and the requirements for implementation of system. Includes roles and responsibilities, relationships, procedures, systems and other information necessary to meet the objectives of the system described.
Policy	Provide requirements and rules for a PAS process and is used to set course of actions and to guide and influence decisions. Policy describes the "what", not the "how".
Standard Operating Procedure	Provide written and consistent set of instructions or steps for execution of a routine process, method, or set of tasks performed by PAS. Includes both

	fundamental and operational elements for implementation of the systems described in PAS manual(s). Assures that activities are performed properly in accordance with applicable requirements. Designed to ensure consistency, protect EHS of employees and environment, prevent failure in the process and ensure compliance with company and regulatory requirements. SOPs describes the "how" based on policy.
Standard Work Instruction	Provide step by step visual and/or written instruction to carry out a specific task to improve competency, minimize variability, reduce work injury and strain, or to boost efficiency and quality of work (performance). SWI are associated with an SOP unless the task described is unrelated to generation of or contribution to environmental data or analytical results.
Template	Pre-formatted document that serves as a starting point for a new document.
Guide	Provide assistance to carry out a task. Most often used for software applications.
Form	Used for a variety of purposes such as to provide a standardized format to record observations, to provide information to supplement an SOP.

PAS Quality Management System Documents: External

Certificate	Lists parameters, methods, and matrices for which the laboratory is certified/accredited to perform within the jurisdiction of the issuing regulatory agency or accreditation body.
Reference Document	Provide information, protocol, instructions, and/or requirements. Issued by the specifier. Examples include quality system standards such as ISO/IEC, TNI, DoD and published referenced methods such as Standard Methods, ASTM, SW846, EPA, and federal and state regulatory bodies.
Project Document	Provides requirements necessary to meet individual client expectations for intended use of data. Examples include: project quality assurance plans (QAPP), client-program technical specifications, contracts, and other agreements.

Document Hierarchy

Rank	Document
1	Reference Documents
2	Corporate Manual
3	Corporate Policy
4	Corporate SOP
5	Corporate SWI, Templates & Forms
6	Laboratory Manual
7	Laboratory SOP
8	Laboratory SWI, Templates, & Forms

4.2.6 Roles and Responsibilities

The roles and responsibilities of technical management and of the quality manager are provided in section 4.1.5.1.2.

4.2.7 Change Management

When significant changes to the quality management system are planned, these changes are managed by corporate quality personnel to assure that the integrity of the quality management system is maintained.

4.3 Document Control

4.3.1 General

The laboratory's procedures for document control are provided in SOP ENV-SOP-CORQ-0015 *Document Management and Control.*

The documents that support the quality management system include internally generated documents such as manuals, policies, standard operating procedures, standard work instructions, forms, guides, and templates and external source documents such as but not limited to, regulations, standards, reference methods, manuals, and project-specific documents.

The laboratory uses electronic document management software (eDMS) to carry out the procedures of the SOP. eDMS automates the process for unique document identification, version control, approval, access, and archival.

4.3.2 Document Approval and Issue

Documents that are part of the quality management system are reviewed by qualified personnel and approved by laboratory management prior by to release for general use.

Local QA maintains a master list of controlled documents used at the laboratory. The master list includes the document control number, document title, and current revision status and is made available to personnel for their reference.

Only the approved versions of documents are available to personnel for use. The eDMS system does not allow user access to draft versions of documents except to personnel assigned to work on the draft. eDMS also restricts access to archived documents except to authorized users, such as local QA, in order to prevent the use of obsolete documents.

See SOP ENV-SOP-CORQ-0015 *Document Management and Control* for more information.

4.3.3 Document Review and Change

Unless a more frequent review is required by regulatory, certification or accreditation program, the laboratory formally reviews documents at least every two years to ensure the document remains current, appropriate, and relevant.

Documents are also informally reviewed every time the document is used. Personnel are expected to refer to and follow instructions in controlled documents when they carry out their work activities. Consequently, any concerns or problems with the document should be caught and brought to the attention of laboratory management on an on-going basis.

Documents are revised whenever necessary to ensure the document remains usable and correct. Older document versions and documents no longer needed are made obsolete and archived for historical purposes.

The laboratory does not allow hand-edits to documents. If an interim change is needed pending re-issue of the document, the interim change is communicated to those that use the document using a formal communication channel, such as SOP Change in Progress form, email, or memorandum.

The document review, revision, and archival process is managed by local QA at the location from which the document was released using the procedures established in SOP ENV-SOP-CORQ-0015 *Document Management and Control.*

4.4 Analytical Service Request, Tender, and Contract Review

The laboratory's management and/or client service personnel perform thorough reviews of requests and contracts for analytical services to verify the laboratory has the capability, capacity, and resources necessary to successfully meet the customer's needs. These review procedures are described in laboratory SOP ENV-SOP-BEAV-0071.

The procedures in this SOP(s) are established to ensure that:

- The laboratory understands the purpose of data collection in order to ensure the test methods requested are appropriate for the intended use of the data and capable of meeting the client's data quality objectives;
- The laboratory and any subcontractor has the capability, capacity, and resources to meet the project requirements and expectations within the requested time frame for delivery of work product;
- Any concerns that arise from review are discussed and resolved with the client; and
- The results of review and any correspondence with the client related to this process and/or any changes made to the contract are recorded and retained for historical purposes.

Capability review confirms that the in-network laboratories and any potential subcontractors hold required certification/accreditation for the test method, matrix, and analyte and verifies the laboratory can achieve the client's target compound list and data quality objectives (DQOs) for analytical sensitivity and reporting limits, QA/QC protocol, and hardcopy test report and electronic data deliverable (EDD) formats.

Capacity review verifies that the in-network laboratories and any potential subcontractors are able to handle the sample load and deliver work production within the delivery time-frame requested.

Resource review verifies that the laboratory and any potential subcontractors have adequate qualified personnel with the skills and competency to perform the test methods and services requested and sufficient and proper equipment and instrumentation needed to perform the services requested.

4.5 Subcontracting and In-Network Work Transfer

The terms 'subcontract' and "subcontracting" refers to work sent to a business external to PAS and the term 'subcontractor' refers to these external businesses, which are also called vendors.

Work transferred within the PAS network is referred to as interregional work orders (IRWO) and network laboratories are referred to as IRWO or network laboratory.

The network of PAS laboratories offers comprehensive analytical capability and capacity to ensure PAS can meet a diverse range of client needs for any type of project. If the laboratory receives a request for analytical services and it cannot fulfill the project specifications, the laboratory's client services team will work with the client to place the work within the PAS network. When it is not possible to place the work within network, the laboratory will, with client approval, subcontract the work to a subcontractor that has the capabilities to meet the project specifications and can meet the same commitment agreed on between the laboratory and the client. Some client programs require

client consent even for IRWO work transfer, and when this applies, the client services team obtains consent as required. The laboratory retains the record of client notification and their consent in the project record for historical purposes.

Whenever work is transferred to a subcontractor or an IRWO laboratory, the laboratory responsible for management of the project verifies each of these qualifications:

- The subcontractor or IRWO laboratory has the proper accreditation/certifications required for the project and these are current; and
- The use of the subcontractor or IRWO laboratory is approved by the client and/or regulatory agency, when approval is required. Record of approval is retained in the project record.

When possible, the laboratory selects subcontractors that maintain a quality management system similar to PAS and that complies with ISO/IEC 17025 and the TNI Standard(s).

PAS also evaluates and pre-qualifies subcontractors as part of company's procurement program. The complete list of approved vendors is maintained by the corporate procurement department and is made available to all PAS locations. Pre-qualification of a subcontractor does not replace the requirement for the placing laboratory to verify the capability, capacity, and resources of any selected subcontractor on a project-specific basis to confirm the subcontractor can meet the client's needs.

For both subcontracting and in-network work transfer, the project specifications are always communicated to the subcontractor or the IRWO laboratory by the project manager so that the laboratory performing the work is aware of and understands these requirements.

The procedures for subcontracting are outlined in the laboratory Subcontracting SOP.

4.6 Purchasing Services and Supplies

Vendors that provide services and supplies to the laboratory are prequalified by corporate procurement personnel to verify the vendor's capability to meet the needs of PAS. These needs include but are not limited to: competitive pricing, capacity to fill purchase orders, quality of product, customer service, and business reputation and stability. The records of vendor evaluation and the list of approved vendors is maintained by the corporate procurement department.

The laboratory may purchase goods and services from any supplier on the approved vendor list.

The specifications (type, class, grade, tolerance, purity, etc.) of supplies, equipment, reagents, standard reference materials and other consumables used in the testing process are specified in SOPs. The SOP specifications are based on the governing requirements of the approved reference methods and any additional program driven regulatory specification, such as drinking water compliance. All requisitions for materials and consumables are approved by the department supervisor to confirm the purchase conforms with specified requirements. After approval the requisition is handled by the laboratory's designated purchasing agent. On receipt, the product is inspected and verified before use, when applicable.

The laboratory's procedure for the purchase of services and supplies is specified in the laboratory's Purchasing SOP.

4.7 Customer Service

Project details and management is handled by the laboratory's customer service team. Each customer is assigned a Project Manager (PM) that is responsible for review of contract requirements and handling laboratory to customer communication about the project status.

4.7.1 Commitment to Meet Customer Expectations

The laboratory cooperates and works closely with our customers to ensure their needs are met and to establish their confidence in the laboratory's capability to meet their needs for analytical services and expectations for service.

Each customer's project is handled by a project manager (PM) that is the customer's primary point of contact. The PM gathers information from the customer to ensure the details of their request are understood. After samples are received, the PM monitors the progress of the project and alerts the customer of any delays or excursions that may adversely impact data usability. Laboratory supervisors are expected to keep the PM informed of project status and any delays or major issues, so that the PM can keep the client informed.

PAS also has a team of subject matter experts (SME) available to provide customers with advice and guidance and any other assistance needed. SME are selected by top management based on their knowledge, experience, and qualifications.

The laboratory encourages customers to visit the laboratory to learn more about the laboratory's capabilities, observe performance and to meet laboratory personnel.

PAS customers expect confidentiality. Laboratory personnel will not divulge or release information to a third party without proper authorization unless the information is required for litigation purposes. See Section 4.1.5.3 of this manual and policy COR-POL-0004 *Ethics Policy* for more information on the laboratory's policy for client confidentiality.

4.7.2 Customer Feedback

The laboratory actively seeks positive and negative feedback from customers through surveys and direct communication. Information from the client about their experience working with the laboratory and their satisfaction with work product is used to enhance processes and practices and to improve decision making. Customer feedback is communicated to laboratory management and corporate personnel in monthly reports and analyzed yearly during management review (See 4.15) to identify risk and opportunity. Corrective, preventive, or continuous improvement actions are taken based on nature of and/or feedback trends.

Also see sections 4.9, 4.10, 4.11, 4.12, 4.14, and 4.15 for more information about how customer feedback is managed by the laboratory and used to enhance the quality management system.

4.8 Complaints

Complaints provide opportunities to improve processes and build stronger working relationships with our clients.

The laboratory's complaint resolution process includes three steps. First, handle and resolve the complaint to mutual satisfaction. Second, perform corrective action to prevent recurrence (See 4.11). Third, record and track the complaint and use these records for risk and opportunity assessment and preventive action (See 4.12)

4.9 Nonconforming Work

4.9.1 Definition of Nonconforming Work

Nonconforming work is work that does not conform to customer requirements, standard specifications, laboratory policies and procedures, or that does not meet acceptance criteria.

The discovery of non-conforming work comes from various sources which include, but are not limited to:

- results of quality control samples and instrument calibrations;
- quality checks on consumables and materials;
- general observations of laboratory personnel;
- data review;
- proficiency testing;
- internal and external audits;
- complaints and feedback;
- management review and reports; and
- regulatory and certification and accreditation actions.

The way in which the laboratory handles nonconforming work depends on the significance and impact (risk) of the issue. Some issues may simply require correction, others may require investigation, corrective action (See 4.11) and/or data recall (See 4.16). When the laboratory releases data and test results associated with nonconforming QC and acceptance criteria test results are qualified or non-conformances are noted in the final analytical report to apprise the data user of the situation. (See 5.10)

Nonconforming work also includes unauthorized departure from laboratory policies, procedures and test methods. Authorized departures are explained in the following subsections. Situations that do not conform to these conditions are considered unauthorized departure(s).

4.9.1.1 Authorized Departure from SOP

An authorized departure from a test method SOP is one that has been reviewed and approved by the Department Manager, Technical Manager, Acting Technical Manager for TNI, Quality Manager, or the General Manager. Review is conducted to confirm the departure does not conflict with regulatory compliance requirements for which the data will be used or does not adversely affect data integrity. The departure may originate from client request or may be necessary to overcome a problem.

An authorized departure from administrative or process-oriented SOP is typically necessary to correct an error in the SOP. These departure requests are reviewed and pre-approved by the local QA Manager. Documentation of SOP departures and approval decisions are retained by the laboratory as evidence that the departure was authorized. When necessary, approved departures from test method SOPs are noted in the final test report to advise the data user of any ramification to data quality.

4.9.1.2 Authorized Departure from Test Methods (Method Modifications)

When test results are associated to a published reference test method, the laboratory's test method SOP must be consistent with the test method. If the test method is mandated for use by a specific regulatory program such as drinking water or wastewater or a certification or accreditation program, such as TNI/NELAC, the SOP must also comply with or include these requirements. If the procedures in the SOP are modified from the test method, these modifications must be clearly identified in the SOP. The conditions under which the laboratory may establish an SOP that is modified from these reference documents, and what is considered a modification are specified in ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.*

Modifications that do not meet the requirements of this SOP (ENV-SOP-CORQ-0011) are unauthorized. Client requests to deviate from the test method are handled as client requests to depart from the test method SOP since it is the SOP that the laboratory follows when performing work.

4.9.1.3 Stop Work Authority

Stop Work Authority provides laboratory personnel with the responsibility and obligation to stop work when there is a perceived unsafe condition or behavior that may result in an unwanted event.

All laboratory and corporate personnel have the authority to stop work when needed to preserve data integrity or safety of workers.

Once a stop work order has been initiated and the reason for doing so is confirmed valid; laboratory management is responsible for immediate correction and corrective action (see section 4.10) before resumption of work.

4.10 Continuous Improvement

The laboratory's quality management system is designed to achieve continuous improvement through the implementation of the quality policy and objectives outlined in this manual. Information about the laboratory's activities and performance is gained from many sources such as customer feedback, audits, QC, trend analysis, business analytics, management reports, proficiency testing, and management systems review. This information is subsequently used during the laboratory's corrective action (see section 4.11) and preventive action (see section 4.12) processes and to establish goals and objectives during annual review of the management system (see section 4.15).

PAS also promotes a continuous improvement culture based on the principles of lean manufacturing. These principles include 3P (Process, Productivity, Performance) and Kaizen. 3P is a platform used by Pace to share best practices and standardization across the network to achieve operational excellence. Kaizen is a team based process used to implement tools and philosophies of lean to reduce waste and achieve flow with the purpose of improving both external and internal customer satisfaction.

4.11 Corrective Action

Corrective action is process used to eliminate the cause of a detected nonconformity. It is not the same as a correction. A correction is an action taken to fix an immediate problem. The goal of the corrective action process is to find the underlying cause(s) of the problem and to put in place fixes to

prevent the problem from happening again. The corrective action process, referred to as CAPA by PAS, is one of the most effective tools used by the laboratory to prevent nonconforming work, identify risk and opportunity, and improve service to our customers.

The laboratory has two general processes for corrective action:

The process used for actions taken in response to day to day quality control (QC) and acceptance criteria exceptions (nonconformance) that occur during the day to day testing process are called corrections. These events do not usually include formal methods for cause analysis; instead the reason for the failure is investigated through troubleshooting or other measures. Required actions for correction of routine nonconformance is specified in laboratory SOPs. When corrective action is not taken, cannot be taken, or is not successful, test results associated with the nonconforming work are qualified in the final test report. Documentation of the nonconformance and corrective action taken is documented in the analytical record.

A formal 7 step corrective action process is used when there is a problem or departure from the quality management system, technical activities, or when the extent of a single problem has significant impact on data, regulatory compliance or customer needs. These problems are identified through various activities such as but not limited to: quality control trends, internal and external audits, management review, customer feedback, and general observation.

The laboratory's 7 Step CAPA Process includes:

1) Define the Problem
2) Define the Scope of the Problem
3) Contain the Problem
4) Root Cause Analysis
5) Plan Corrective Action
6) Implement Corrective Action
7) Follow Up / Effectiveness Check

The formal CAPA process may be initiated by any employee. Once the process is initiated it is overseen and coordinated by laboratory management. The CAPA process is documented using an electronic or paper-based system. The CAPA record includes tracking information, dates, individuals involved, those responsible for action plan implementation and follow-up, and timelines and due dates.

For more information about the laboratory's procedure for corrective action, see the laboratory SOP ENV-SOP-BEAV-0124 *Corrective and Preventative Actions*. Additional explanation about certain aspects of the laboratory's corrective action process are outlined in the next three subsections.

4.11.1 Root Cause Analysis

Root cause analysis (RCA) is the process of investigation used by the laboratory to identify the underlying cause(s) of the problem. Once causal factors are identified, ways to mitigate the causal factors are reviewed and corrective action(s) most likely to eliminate the problem are selected.

The laboratory uses different methods to conduct this analysis. The most common approach is 5-Why, but fishbone diagrams, or even brainstorming may be appropriate depending on the situation. The method used is documented in the CAPA record.

4.11.2 Effectiveness Review

Monitoring corrective actions for effectiveness is shared by laboratory supervisors and quality assurance personnel. Effectiveness means the actions taken were sustainable and appropriate. Sustainable means the change is still in place. Appropriate means the action(s) taken prevented recurrence of the problem since the time corrective action was taken.

The time-frame in which effectiveness review takes place depends on the event and is recorded in the CAPA record with any addition actions that need to be taken.

Corrective action trends are also monitored by laboratory management and used to identify opportunities for preventive action or to gain lessons learned when actions taken were not adequate to solve the problem. See Section 4.12 (Preventive Action) and 4.15 (Management Review) for more information.

4.11.3 Additional Audits

When non-conformances or other problems cast doubt on compliance with the laboratory's policies, procedures, or compliance to regulatory requirements; laboratory management schedules a special audit of the area of activity in accordance with Section 4.14.1 as soon as possible. These special audits are used to determine the scope of the problem and to provide information for the CAPA process. Additional full-scale audits are done when a serious issue or risk to the laboratory's business is identified.

4.12 Preventive Action

Preventive action is an action taken to eliminate the cause of a potential nonconformity and to achieve improvement. Preventive action is a forward thinking process designed to prevent problems opposed to reacting to them (corrective action).

Some examples of preventative action include, but are not limited to:

- Scheduled instrument maintenance (Preventative maintenance)
- Addition of Staff and Equipment
- Professional Development Activities
- Implementation of New Technology

The laboratory looks for opportunities for preventive action from a variety of sources including but not limited to: employee idea's, customer feedback, business partners input, trend analysis, business analytics, management reviews, proficiency testing results, lean management events, and risk-benefit analysis.

The process for preventive actions follows the same 7 step process for corrective action except "problem" is replaced with "opportunity", "cause analysis" is replaced with "benefit analysis", and "corrective action" is replaced with "preventive action".

Laboratory management evaluates the success of preventive actions taken in any given year during annual management review. See Section 4.15 for more information.

4.12.1 Change Management

Preventive actions may sometimes result in significant changes to processes and procedures used by the laboratory. Laboratory management evaluates the risks and benefits of change and includes in its implementation of change process, actions to minimize or eliminate any risk. The types of changes for which risk are considered and managed include: infrastructure change, change in analytical service offerings, certification or accreditation status, instrumentation, LIMS changes, and changes in key personnel.

For more information about the laboratory's procedures for preventive action see the laboratory's SOP on Corrective and Preventative Actions (CAPA).

4.13 Control of Records

A record is a piece of evidence about the past, especially an account of an act or occurrence kept in writing or some other permanent form. Laboratory records document laboratory activities and provide evidence of conformity to the requirements established in the quality management system. These records may be hardcopy or electronic on any form of media.

4.13.1 General Requirements

4.13.1.1 Procedure

The laboratory's procedures for control of records is provided in the laboratory's SOP on Data Retention.

The procedures in the SOP are established to assure quality and technical records are identified, retained, indexed, and filed to allow for retrieval during the entire retention time frame. During storage, records are kept secure and protected from deterioration. At the end of the retention time, the records are disposed of properly in order to maintain client confidentiality and to protect the interests of the company.

In general, laboratory records fall into three categories: quality, technical, and administrative.

Examples of each are provided in the following table:

Record Type	Includes Records of:
Quality	Documents: Document Types listed in SOP ENV-SOP-CORQ-016 Audits: Internal and External Certificates and Scopes of Accreditation Corrective & Preventive Action Management Review Data Investigations Method Validation Instrument Verification Training Records
Technical	Raw Data Logbooks Certificates of Traceability Analytical Record Test Reports & Project Information Technical Training Records & Demonstration of Capability
Administrative	Personnel Records Finance/Business

4.13.1.2 Record Legibility and Storage

Records are designed to be legible and to clearly identify the information recorded. Manual entries are made in indelible ink; automated entries are in a typeface and of sufficient resolution to be read. The records identify laboratory personnel that performed the activity or entered the information.

Records are archived and stored in a way that they are retrieved. Access to archived records is controlled and managed.

For records stored electronically, the capability to restore or retrieve the electronic record is maintained for the entire retention period. Hardcopy record are filed and stored in a suitable environment to protect from damage, deterioration, or loss. Hardcopy records may be scanned to PDF for retention. Scanned records must be checked against the hardcopy to verify the scan is complete and legible.

Records are kept for a minimum of 5 years unless otherwise specified by the client or regulatory program.

The date from which retention time is calculated depends on the record. In general, the retention time of technical records of original observation and measurement is calculated from the date the record is created. If the technical record is kept in a chronological logbook, the date of retention may be calculated from the date the logbook is archived. The retention time of test reports and project records, which are considered technical records, is calculated from the date the test report was issued. The retention time of quality records is usually calculated from the date the record is archived.

Refer to the laboratory's record management policy for more information.

4.13.1.3 Security

The laboratory is a secure facility and access to records is restricted to laboratory personnel.

4.13.1.4 Electronic Records

The data systems used to store electronic records is backed up in accordance with Pace policy ENV-POL-CORQ-0013, the Record Management Policy. Access to archived records stored electronically is maintained by personnel responsible for management of the electronic system.

4.13.2 Technical Records

In addition to the requirements identified in subsections 4.13.1.1 through 4.13.1.4, the requirements in the following subsections also apply to technical records.

4.13.2.1 Description

Technical records are the accumulation of data and information generated from the analytical process. These records may include forms, worksheets, workbooks, checklists, notes, raw data, calibration records, final test reports, and project record. The accumulated record essentially need to provide sufficient detail to historically

reconstruct the process and identify the personnel that performed the tasks associated with a test result.

4.13.2.2 Real Time Recordkeeping

Personnel are instructed and expected to always record observations, data, and calculations at the time they are made. Laboratory managers are responsible to assure that data entries, whether made electronically or on hardcopy, are identifiable to the task.

4.13.2.3 Error Correction

Errors in records must never erased, deleted or made illegible. Use of correction fluid, such as white-out is prohibited. In hardcopy records, the error is corrected by a single-strike through the original entry and the new entry recorded alongside or footnoted to allow for readability. Corrections are initialed and dated by the person making the correction. If the correction is not self-explanatory, a reason for the correction is recorded.

For electronic records, equivalent measures of error correction or traceability of changes made is kept. For example, audit trails provide records of change.

Maintenance of proper practices for error correction is monitored through the tiered data review process described in Section 5.9.3. Laboratory records are reviewed throughout the data review process. Individuals performing these reviews flag errors that are not properly corrected and bring these to the attention of the department manager or supervisor of the work area in which the record was generated so that the problem may be addressed and corrected with the individual(s) that did not make the correction properly.

4.14 Audits

The laboratory performs internal systems and technical audits to assess compliance to this manual and to other laboratory procedures, such as policy, SOP and SWI. Since the processed in this manual are based on the relevant quality system standards and regulatory and accreditation/certification program requirements the laboratory provides services for, the internal audits also assess on-going compliance to these programs.

The laboratory is also audited by external parties such as regulatory agencies, customers, consultants and non-government assessment bodies (NGAB).

Information from internal and external audits is used by laboratory management to address compliance concerns and opportunities where improvement will increase the reliability of data.

Deficiencies, observations and recommendations from audits are managed by local QA using the laboratory's formal CAPA process. See Section 4.11 for more information.

4.14.1 Internal Audit

The laboratory's internal audit program is managed by local QA in accordance with a pre-determined audit schedule established at the beginning of each calendar year. The schedule is prepared to assure that all areas of the laboratory are reviewed over the course of the year.

Conformance to the schedule is reported to both laboratory management and corporate quality personnel in a monthly QA report prepared by the quality manager.

Although the QA Manager creates the audit schedule, it is the shared responsibility of local QA and laboratory managers to assure the schedule is maintained. Laboratory supervisors cooperate with QA to provide the auditors with complete access to the work area, personnel, and records needed.

Internal audits are performed by personnel approved by the quality manager. In general, personnel may not audit their own activities unless it can be demonstrated that an effective and objective audit will be carried out. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation.

The laboratory's internal audit program includes:

- System Audits & Method Audits: The purpose of these audits is to determine if daily practice is consistent with laboratory's SOPs and if SOPs are compliant with adjunct policy and procedures. Auditing techniques includes analyst interviews and observation and records review. These audits are performed per the pre-determined schedule.
- Raw Data / Final Test Report Audits: The purpose of these audits is to review raw data and/or a final test reports to verify the final product is consistent with customer/project requirements and supported as compliant to SOPs, reference methods, with test results that are properly qualified when necessary, accurate, and of known and documented quality. The reviews should also identify opportunities for improvement and best practices.
- Special Audits: Special audits are those performed ad hoc to follow up on specific a specific issue such as a client complaint, negative feedback, concerns of data integrity or ethics, or a problem identified through other audits. Special audits may be scheduled or unscheduled. Unscheduled internal audits are conducted whenever doubts are cast on the laboratory's compliance with regulatory requirements or its own policies and procedures. These unscheduled internal audits may be conducted at any time and may be performed without an announcement to laboratory personnel.

When observations and findings from any audit (internal or external) cast doubt on the validity of the laboratory's testing results, the laboratory takes immediate action to initiate investigate the problem and take corrective action. (Also see 4.11 and 4.16)

The laboratory's internal audit program and auditing procedures are further described in laboratory SOP ENV-SOP-BEAV-0129 *Internal Audits*.

4.14.1.1 Corporate Compliance Audit

The laboratory may also be audited by corporate quality personnel to assess the laboratory's compliance to the company's quality management program and to evaluate the effectiveness of implementation of the policies and procedures that make up the quality management system. The purpose of the compliance audit is to identify risks and opportunities and to assist laboratory management to achieve the goals and objectives of the company's quality program.

4.15 Management Review

The laboratory's management team formally reviews the management system on an annual basis to assess for on-going suitability and effectiveness and to establish goals, objectives, and action plans for the upcoming year.

At a minimum, following topics are reviewed and discussed:

- The on-going suitability of policies and procedures including HSE (Health, Safety and Environment) and waste management;
- Reports from managerial and supervisory personnel including topics discussed at regular management meetings held throughout the year;
- The outcome of recent internal audits;
- Corrective and preventive actions;
- Assessments by external bodies;
- The results of interlaboratory comparisons or proficiency tests;
- Changes in the volume and type of the work;
- Customer and personnel feedback, including complaints;
- Effectiveness of improvements / preventive actions made since last review;
- Internal and external issues of relevance and risk identification;
- A review of the status of actions from prior management reviews; and
- Other relevant factors, such as quality control activities, resources, and staff training.

The discussion and results of this review are documented in a formal report prepared by laboratory management. This report includes a determination of the effectiveness of the management system and its processes; goals and objectives for improvements in the coming year with timelines and responsibilities, any other need for change. See Pace SOP ENV-SOP-CORQ-0005 for more information.

Goals and action items from annual management systems review are shared with employees to highlight focus areas for improvement in addition to areas in which the laboratory has excelled.

4.16 Data Integrity

Customers whose data are affected by these events are notified in a timely manner, usually within 30 days of discovery. Some accreditation programs also require notification to the accreditation body (AB) within a certain time-frame from date of discovery when the underlying cause of the issue impacts accreditation. The laboratory follows any program or project specific client notification requirements for notification, when applicable.

5.0 TECHNICAL REQUIREMENTS

5.1 General

Many factors contribute to the correctness and reliability of the technical work performed by the laboratory. These factors are fall under these general categories:

- Human Performance
- Facility and Environmental Conditions
- Test Method Performance and Validation
- Measurement Traceability
- Handling of Samples

The impact of each of these factors varies based on the type of work performed. To minimize negative effects from each these factors, the laboratory takes into account the contribution from each of these categories when developing test method and process (administrative) SOPs, evaluating personnel qualifications and competence, and in the selection of equipment and supplies used.

5.2 Personnel

5.2.1 Personnel Qualifications

The laboratory's program for personnel management is structured to ensure personnel are selected, qualified, and competent to perform the roles and responsibilities of their position based on education, experience, and training.

Qualifications, duties, responsibilities, and authorities of each position are specified in job descriptions maintained by corporate HR (See Section 5.2.4). These job descriptions provide the general basis for the selection of personnel for hire and are used by the laboratory to communicate to personnel the duties, responsibilities, and authorities of their position.

The term "personnel" refers to individuals employed by the laboratory directly as full-time, part-time, or temporary, and individuals employed by the laboratory by contract, such as through an employment agency. The term "personnel" is used interchangeably with the term "employee" throughout this manual. For purposes of this manual, these terms are equivalent.

The personnel management program is structured to establish and maintain records for each of the following:

- Selection of personnel;
- Training of personnel;
- Supervision of personnel;
- Authorization of personnel; and
- Monitoring Competence of personnel.

5.2.1.1 Competence

Competence is the ability to apply a skill or series of skills to complete a task or series of tasks correctly within defined expectations.

Competence for technical personnel authorized by PAS to provide opinion and interpretation of data to customers also includes the demonstrated ability to:

- Apply knowledge, experience, and skills needed to safely and properly use equipment, instrumentation, and materials required to carry out testing and other work activities in accordance with manufacturer specifications and laboratory SOPs;
- Understand and apply knowledge of general regulatory requirements necessary to achieve regulatory compliance in work product; and
- Understand the significance of departures and deviations from procedure that may occur during the analytical testing process and the capability and initiative to troubleshoot and correct the problem, document the situation and decision making process, and to properly qualify the data and analytical results.

The laboratory's requirements for the competence of personnel (education, qualification, work experience, technical skills, and responsibilities) are specified in job descriptions created by management and kept by human resources (HR). The job description provides the basis for the selection of personnel for each position.

An employee is considered competent when he/she has completed required training.

The policies and standard operating procedures (SOPs) for the following topics are established by management as minimum required training for all personnel:

- Ethics and Data Integrity
- Quality Manual
- Safety Manual
- Quality Management System
- Technical Process and Procedure relevant to their job tasks
- Successful Demonstration of Capability (DOC) – Analytical Personnel Only

Personnel are initially authorized competent to independently carry out their assigned duties when required training is complete and documented.

Records of training and qualification provide the record of competence for the individual. Qualification records may include but are not limited to diploma, transcripts, and curriculum vitae (CV).

The on-going competence of each employee is monitored by laboratory management through on-the-job performance. Analytical employees are also required to successfully complete another demonstration capability for each test method performed on an annual basis.

5.2.2 Training

Training requirements are outlined in policies COR-POL-0023 *Mandatory Training Policy* and COR-POL-0004 *Ethics Policy*. Additional training requirements may also be specified in other documents, such as manuals.

5.2.2.1 Training Program and Goals

The laboratory's training program includes 4 elements:

- Identification of Training Needs
- Training Plan Development and Execution
- Documentation and Tracking
- Evaluation of Training Effectiveness

Laboratory management establishes goals and training needs for individual employees based on their role, education, experience, and on-the-job performance.

Training needs for all employees are based on business performance measures that include but are not limited to:

- Quality Control Trends
- Process Error / Rework Trends
- Proficiency Testing Results
- Internal & External Audit Performance
- Management Review Goals

Training is delivered using various methods that incorporate techniques that appeal to the main learning styles: visual, aural, linguistic, and kinesthetic. Techniques include, on-the-job, instructor-led, self-study, eLearning, and blended.

The employee's direct supervisor is responsible for oversight of the employee's training plan and for providing adequate time to the employee to complete training assignments. Both the supervisor and employee are responsible to make sure the employee's training status and training records are current and complete.

The laboratory's QA department monitors the training status of personnel and provides the status to the General Manager (GM or AGM) at least monthly or more frequently, if necessary. The status report is used by laboratory management to identify overdue training assignments, the reasons for the gaps, and to make arrangements for completion.

The following subsections highlight specific training requirements:

5.2.2.1.1 New Hire Training

New hire training requirements apply to new personnel and to existing employee's starting in a new position or different work area.

Required new hire training includes each of the following:

- Ethics and Data Integrity (See 5.2.2.1.3)
- Quality Manual / Quality Management System (See 5.2.2.1.4)
- Safety Manual and any training requirements specified in the manual.
- Policies & SOPs relevant to their job tasks
- Technical personnel that test samples must also successfully complete an initial demonstration of capability (IDOC) for the test methods performed before independently testing customer samples. (See 5.2.2.1.5). Independent testing means handling of client samples without direct supervision of the work activity by the supervisor or a qualified trainer.

All required training must be current and complete before the employee is authorized to work independently. Until then, the employee's direct supervisor is responsible for review and acceptance of the employee's work product.

5.2.2.1.2 On-Going Training

Personnel receive on-going training in each of the following topics:

- Ethics and Data Integrity (See 5.2.2.1.3)
- Quality Manual / Quality Management System (See 5.2.2.1.4)
- Safety Training
- Changes to Policies & SOPs
- Specialized Training
- Technical employees that carry of testing must also successfully complete on-going demonstration of capability (ODOC) for all test methods performed on an annual basis. (See 5.2.2.1.5)

Personnel are expected to maintain their training status and records of training current and complete and to complete training assignments in a timely manner.

5.2.2.1.3 Ethics and Data Integrity Training

Data integrity training is provided to all new personnel and refresher data integrity training is provided to all employees on an annual basis. Personnel are required to acknowledge they understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences including immediate termination, debarment, or civil/criminal prosecution.

The initial data integrity training and the annual refresher training is documented with a signature attendance sheet or other form of

documentation to provide evidence that the employee has participated in training on this topic and understand their obligations related to data integrity.

The following topics and activities are covered:

- Policy for honesty and full disclosure in all analytical reporting;
- Prohibited Practices;
- How and when to report data integrity issues;
- Record keeping. The training emphasizes the importance of proper written documentation on the part of the analyst with respect to those cases where analytical data may be useful, but are in one sense or another partially nonconforming;
- Training Program, including discussion regarding all data integrity procedures;
- Data integrity training documentation;
- In-depth procedures for data monitoring; and
- Specific examples of breaches of ethical behavior such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards.

All PAS personnel, including contract and temporary, are required to sign an "Attestation of Ethics and Confidentiality" at the time of employment and during annual refresher training. This document clearly identifies inappropriate and questionable behavior. Violations of this document result in serious consequences, including prosecution and termination, if necessary.

Also see SOP-ENV-COR-POL-0004 *Ethics Policy* for more information.

5.2.2.1.4 Management System Documents Training

PAS Manuals, policies, and SOPs are the primary documents used by regulatory bodies and PAS customers to verify the laboratory's capability, competency. and compliance with their requirements and expectations.

In addition to on-the-job training, employees must have a signed Read and Acknowledgement Statement on record for the laboratory quality manual, and the policies and SOPs relating to his/her job responsibilities. This statement when signed by the employee electronically or by wet signature, confirms that the employee has received, read, and understands the content of the document, that the employee agrees to follow the document when carrying out their work tasks; and the employee understands that unauthorized change

to procedures in an SOP is not allowed except in accordance with the SOP departure policy (See 4.9.9.1) and SOP ENV-CORQ-0016 *Standard Operating Procedures and Standard Work Instructions* for more information.

5.2.2.1.5 Demonstration of Capability (DOC)

Technical employees must also complete an initial demonstration of capability (IDOC) prior to independent work on client samples analyzed by the test methods they perform. After successful IDOC, the employee must demonstrate continued proficiency (CDOC) for the test method on an annual basis. If more than a year has passed since the employee last performed the method; then capability must be re-established with an IDOC.

Demonstration of capability (IDOC and DOC) is based on the employee's capability to achieve acceptable precision and accuracy for each analyte reported by the laboratory for the test method using the laboratory's test method SOP.

Records of IDOC and ODOC are kept in the employee's training file.

For more information, see laboratory method SOPs.

5.2.2.2 Effectiveness of Training

The results of the performance measures used to identify training needs are the same measures used by the laboratory to measure effectiveness of the training program. Improvement in key performance measures suggest the training program is successful. (See 5.2.2.1)

Effectiveness of individual employee training is measured by their demonstrated ability to comprehend the training material and apply knowledge and skills gained to their job task. Measurements include but are not limited to:

- Testing of the employee's knowledge of the quality management system, policies, and technical and administrative procedures through various mechanisms, such as quizzes, observation, and interviews.
- Demonstrated ability to convey information correctly and factually in written and verbal communication to internal and external parties.
- Demonstrated ability to carry out tasks in accordance with SOPs and other work instructions.
- Demonstrated ability to make sound decisions based on guidance and information available.
- Demonstrated initiative to seek help or guidance when the employee is unsure of how to proceed.

5.2.3 Personnel Supervision

Every employee is assigned a direct supervisor, however named, who is responsible for their supervision. Supervision is the set of activities carried out by the supervisor to oversee the progress and productivity of the employees that report to them.

General supervisory responsibilities may include but are not limited to:

- Hiring Employees
- Training Employees
- Performance Management
- Development, oversight, and execution of personnel training plans
- Monitoring personnel work product to assure the work is carried out in accordance with this quality manual, policies, SOPs, and other documents that support the quality management system.

5.2.4 Job Descriptions

Job Descriptions that define the required education, qualifications, experience, skills, roles and responsibilities, and reporting relationships for each PAS position are established by top management and kept by corporate HR. PAS laboratories use these job descriptions as the source of positions and job titles for the laboratory. The job descriptions apply to employees who are directly employed by PAS, part-time, temporary, technical and administrative and by those that are under contract with PAS through other means.

The job descriptions include the education, expertise, and experience required for the position and the responsibilities and duties, including any supervisory or managerial duties assigned to the position.

5.2.5 Authorization of Technical Personnel

Laboratory management authorizes technical personnel to perform the technical aspects of their position after it has been verified that the employee meets the qualifications for the position, has successfully completed required training, and the employee has demonstrated capability. After initial authorization, technical personnel are expected to maintain a current and complete training record, demonstrate on-going capability at least annually for each test method performed, and produce reliable results through accurate analysis of certified reference materials, proficiency testing samples, and/or routine quality control samples in order to remain authorized to continue to perform their duties.

Records to support authorization including, education, experience, training, and other evaluations are kept by the laboratory.

5.3 Accommodations and Facilities

5.3.1 Facilities

The laboratory is designed to support the correct performance of procedures and to not adversely affect measurement integrity or safety. Access to the laboratory is controlled by various measures, such as card access, locked doors, main entry. Visitors to the laboratory are

required to sign-in and to be escorted by laboratory personnel during their visit. A visitor is any person that is not an employee of the laboratory.

5.3.2 Environmental Conditions

The laboratory is equipped with energy sources, lighting, heating, and ventilation necessary to facilitate proper performance of calibrations and tests. The laboratory ensures that housekeeping, electromagnetic interference, humidity, line voltage, temperature, sound and vibration levels are appropriately controlled to ensure the integrity of specific measurement results and to prevent adverse effects on accuracy or increases in the uncertainty of each measurement.

Environmental conditions are monitored, controlled, and recorded as required by the relevant specifications, methods, and procedures. Laboratory operations are stopped if it is discovered that the laboratory's environmental conditions jeopardize the analytical results.

5.3.3 Separation of Incompatible Activities

The layout and infrastructure of each work area including air handling systems, power supplies, and gas supplies of each laboratory work area is specifically designed for the type of analytical activity performed. Effective separation between incompatible work activities is maintained. For example, sample storage, preparation, and chemical handling for volatile organic analysis (VOA) is kept separate from semi-volatile organic (SVOA).

The laboratory separates samples known or suspected to contain high concentration of analytes from other samples to avoid the possibility for cross-contamination. If contamination is found, the source of contamination is investigated and resolved in accordance with laboratory SOPs.

5.3.4 Laboratory Security

Security is maintained by controlled access to the building and by surveillance of work areas by authorized personnel. Access is controlled to each area depending on the required personnel, the sensitivity of the operations performed, and possible safety concerns. The main entrance is kept unlocked during normal business hours for visitors, and is continuously monitored by laboratory staff. All visitors must sign a visitor's log, and a staff member must accompany them during the duration of their stay.

5.3.5 Good Housekeeping

The laboratory ensures good housekeeping practices in work areas to maintain a standard of cleanliness necessary for analytical integrity and personnel health and safety. Minimally, these measure include regular cleaning of the work area. Where necessary, areas are periodically monitored to detect and resolve specific contamination and/or possible safety issues.

5.4 Test Methods

5.4.1 General Requirements

The laboratory uses test methods and procedures that are appropriate for the scope of analytical services the laboratory offers.

Instructions on the use and operation of equipment and sample handling, preparation, and analysis of samples are provided in SOPs. The instructions in SOPs may be supplemented

with other documents including but not limited to, standard work instructions (SWI), manuals, guides, project documents and reference documents.

These documents are managed using the procedures described in SOP ENV-SOP-CORQ-0015 *Document Management and Control* and SOP ENV-SOP-CORQ-0016 *Standard Operating Procedures and Standard Work Instructions.*

Deviations to test method and SOPs are allowed under certain circumstances. See sections 4.9.1.1 and 4.9.1.2 for more information.

5.4.2 Method Selection

The test methods and protocols used by the laboratory are selected to meet the needs of the customer, are appropriate for the item tested and intended use of the data, and to conform with regulatory requirements when regulatory requirements apply.

In general, the test methods offered are industry accepted methods published by international, regional, or national standards. The laboratory bases its procedure on the latest approved edition of a method unless it is not appropriate or possible to do so or unless regulatory requirements specify otherwise.

The laboratory confirms that it can perform the test method and achieve desired outcome before analyzing samples (see section 5.4.5). If there is a change in the published analytical method, then the confirmation is repeated.

When a customer does not specify the test method(s) to be used, the laboratory may suggest test methods that are appropriate for the intended use of the data and the type of samples to be tested. The laboratory will also inform customers when test methods requested are considered inappropriate for their purpose and/or out of date. This discourse takes place during review of analytical service requests (See Section 4.4).

5.4.3 Laboratory Developed Methods

A laboratory developed method is a method developed from scratch (no published source method), a procedure that modifies the chemistry from the source method, or a procedure that exceeds the scope and application of the source method.

Laboratory developed methods must be validated prior to use (see section 5.4.5) and the procedure documented in a test method SOP.

The requirements for non-standard methods (Section 5.4.4) also apply to laboratory developed methods.

5.4.4 Non-standard Methods

A non-standard method is a method that is not published or approved for use by conventional industry standards for the intended purpose of the data. Non-standard methods must be validated prior to use (see section 5.4.5) and the procedure developed and documented in a test method SOP.

At a minimum, the following information must be included in the procedure:

- Title / Identification of Method;
- Scope and Application;

- Description of the type of item to be analyzed;
- Parameters or quantities and ranges to be determined;
- Apparatus and equipment, including technical performance requirements;
- Reference standards and reference materials required;
- Environmental conditions required and any stabilization period needed
- Description of the procedure, including:
    - Affixing identification marks, handling, transporting, storing and preparing of items;
    - Checks to be made before the work is started;
    - Verifying equipment function and, where required, calibrating and/or adjusting the equipment before each use;
    - Method of recording the observations and results;
    - Any safety measures to be observed;
    - Criteria and/or requirements for approval/rejection;
    - Data to be recorded and method of analysis and presentation; and
    - Uncertainty or procedure for estimating uncertainty.

Use of a non-standard method for testing must be agreed upon with the customer. The agreement, which is retained by the laboratory in the project record, must include the specifications of the client's requirements, the purpose of testing, and their authorization for use of the non-standard method.

5.4.5 Method Validation

5.4.5.1 Validation Description

Validation is the process of conformation and the provision of objective evidence that the stated requirements for a specific method/procedure are fulfilled.

The laboratory's requirements and procedures for method validation are outlined in SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.*

5.4.5.2 Validation Summary

All test methods offered by the laboratory are validated before use to confirm the procedure works and the data and results achieved meet the goals for the method. The extent of validation performed is based on technology and other factors as defined in the method validation SOP (ENV-SOP-CORQ-0011).

Results of validation are retained and kept in accordance with the laboratory's policy for retention of technical records.

The need to repeat validation is assessed by laboratory management when there are changes to the test method.

5.4.5.3 Validation of Customer Need

Laboratory management reviews the results of test method validation, which include accuracy, precision, sensitivity, selectivity, linearity, repeatability, reproducibility, robustness, and cross-sensitivity, against general customer needs to ensure the laboratory's procedure for the test method will meet those needs.

The review procedure is detailed in SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.*

The following subsections highlight some of these concepts:

5.4.5.3.1 Accuracy

Accuracy is the degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard. When the result recovers within a range from the known value (control limit); the result generated using the laboratory's test method SOP is considered accurate.

5.4.5.3.2 Precision

Precision refers to the closeness of two or more measurements to each other. It is generally measured by calculating the relative percent difference (RPD) or relative standard deviation (RSD) from results of separate analysis of the same sample. Precision provides information about repeatability, reproducibility, and robustness of the laboratory's procedure.

5.4.5.3.3 Limits of Detection (LOD) (Chemistry)

The LOD is the minimum result which can be reliably discriminated from a blank with a predetermined confidence level. The LOD establishes the limit of method sensitivity and is also known as the detection limit (DL) or the method detection limit (MDL).

Values below the LOD cannot be reliably measured and are not reported by the laboratory unless otherwise specified by regulatory program or test method.

The LOD is established during method validation and after major changes to the analytical system or procedure that affect sensitivity are made.

The laboratory's procedure for LOD determination is detailed in laboratory SOP ENV-SOP-BEAV-0120 *Determination of Detection and Quantitation Limits*. The SOP complies with 40 CFR 136 Appendix B or the current industry approved and accepted guidance for this process.

5.4.5.3.4 Limits of Quantitation (LOQ) and Reporting Limit (RL)

The LOQ is the minimum level, concentration, or quantity of a target analyte that can be reported with a specified degree of

confidence. The LOQ is established at the same time as the LOD. The laboratory's procedure for determination and verification of the LOQ is detailed in laboratory SOP ENV-SOP-BEAV-0120 *Determination of Detection and Quantitation Limits.*

The LLOQ is the value of the lowest calibration standard. The LOQ establishes the lower limit of quantitation.

The LOQ and LLOQ represent quantitative sensitivity of the test method.

- The LOQ must always be equal to or greater than the LLOQ and the LLOQ must always be greater than the LOD.
- Any reported value (detect or non-detect) less than the LLOQ is a qualitative value.

The RL is the value to which the presence of a target analyte is reported as detected or not-detected. The RL is project-defined based on project data quality objectives (DQO). In the absence of project specific requirements, the RL is usually set to the LOQ or the LLOQ. Depending on the relationship of the RL to the LLOQ or LOQ, both the RL value may be or quantitative.

For more information, refer to laboratory SOP ENV-SOP-BEAV-0120 *Determination of Detection and Quantitation Limits.*

5.4.5.3.5 Linearity

Linearity is a mathematical concept applied to calibration models that employ multiple points to establish a calibration range used for quantitative analysis. Linearity is measured differently based on the calibration model. In general, if linearity is demonstrated then the slope of the response of standards are sufficiently close to one another. The accuracy of the linear regression and non-linear curves is verified by checking percent error or relative standard error (RSE), which is the process of refitting calibration data back to the model to determine if the results are accurate. For linear curves that use average calibration or response factor, error is measured by relative standard difference (RSD).

Linearity also establishes the range of quantitation for the test method used which directly impacts the sensitivity of the test method and uncertainty in measurement results. As previously noted, the LLOQ establishes the lower limit of quantitation. Similarly, the upper range of linearity establishes the upper limit of quantitation. In general, results outside of this range are considered qualitative values. However, some inorganic methods allow for extension of the linear range above the upper limit of quantitation when accuracy at this value is verified.

Linearity can also be used to establish repeatability, reproducibility, and robustness of the laboratory's test method. When linearity is demonstrated using a specific calibration model during method validation, then use of this same calibration model to achieve linearity on a day to day basis confirms the laboratory's method is repeatable, reproducible, and robust.

5.4.5.3.6 Demonstration of Capability (DOC)

The DOC performed during method validation confirms that the test method acceptable precision and accuracy. The procedure used for DOC for method validation is the same as described in section 5.2.2.1.5 for demonstration of analyst capability.

5.4.6 Measurement Uncertainty

The laboratory provides an estimate of uncertainty in testing measurements when required or on client request. In general, the uncertainty of the test method is reflected in the control limits used to evaluate QC performance. (See 5.9.1.1.10). ISO/IEC supports this concept with language that reads when a well-recognized test method specifies limits to the values of the major source of uncertainty of measurement and specifies the form of presentation of calculated results, the laboratory has satisfied the requirements on analytical uncertainty by following the test method and reporting instructions.

When measurement uncertainty cannot be satisfied through control limits, the laboratory will provide a reasonable estimation of uncertainty. A reasonable estimation is based on knowledge of method performance and previous experience. When estimating the analytical uncertainty, all uncertainty components which are of importance in the given situation are taken into account.

5.4.7 Control of Data

The laboratory has policies and processes in place to assure that reported data is free from calculation and transcription errors, that quality control is reviewed and evaluated before data is reported, and to address manual calculation and integration.

5.4.7.1 Calculations, Data Transfer, Reduction and Review

Whenever possible, calculations, transfer of data, and data reduction are performed using validated software programs. (See 5.4.7.2)

If manual calculations are necessary, the results of these calculations are verified during the data review process outlined in section 5.9.3.

5.4.7.1.1 Manual Integration

The laboratory's policy and procedures for manual integration are provided in SOP ENV-SOP-CORQ-0006 *Manual Integration*.

This SOP includes the conditions under which manual integration is allowed and the requirements for documentation.

Required documentation of manual integration includes:

- complete audit trail to permit reconstruction of before and after results;
- identification of the analyst that performed the integration and the reason the integration was performed; and
- the individual(s) that reviewed the integration and verified the integration was done and documented in compliance with the SOP.

5.4.7.2 Use of Computers and Automated Acquisition

Whenever possible the laboratory uses software and automation for the acquisition, processing, recording, reporting, storage, and/or retrieval of data.

Software applications developed by PAS are validated by corporate IT for adequacy before release for general use. Commercial off the shelf software is considered sufficiently validated when the laboratory follows the manufacturer or vendor's manual for set-up and use. Records of validation are kept by the corporate information technology (IT) group or by the local laboratory, whichever group performed the validation.

The laboratory's process for the protection of data stored in electronic systems include:

- Individual user names and passwords for Laboratory Information Management Systems (LIMS) and auxiliary systems used to store or process data.
- Employee Training in Computer Security Awareness
- Validation of spreadsheets used for calculations to verify formulas and logic yield correct results and protection of these cells to prevent unauthorized change.
- Operating system and file access safeguards
- Protection from Computer Viruses
- Regular system backup; and testing of retrieved data

The laboratory's process for software development and testing process includes:

- Verification the software application works as expected and is adequate for use and fulfills compliance requirements, such as the need to record date/time of data generation.
- Change control to assure requests for changes are reviewed and approved by management before the change is made.
- Communication channels to assure all staff are aware of changes made.
- Version Control and maintenance of historical records.

5.5 Equipment

5.5.1 Availability of Equipment

The laboratory is furnished with all equipment and instrumentation necessary to correctly perform the tests offered in compliance with the specifications of the test method and to achieve the accuracy and sensitivity required.

5.5.2 Calibration

Equipment and instrumentation is checked prior to use to verify it performs within tolerance for its intended application.

Laboratory management is made aware of the status of equipment and instrumentation and any needs for either on a daily basis. This information is obtained during laboratory walkthroughs (LDM) that are conducted as part of the laboratory's lean program.

5.5.2.1 Support Equipment

The laboratory confirms support equipment is in proper working order and meets the specifications for general laboratory use prior to placement in service and with intermediate checks thereafter. Equipment that does not meet specifications is removed from service until repaired or replaced. Records of repair and maintenance activities are maintained.

Procedures used to carry out and record these checks are outlined laboratory SOP ENV-SOP-BEAV-0128 *Support Equipment*.

5.5.2.2 Analytical Instruments

Analytical instruments are checked prior to placement in service in accordance with SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.* After the initial service date, the calibration of instruments and verification calibration is performed in accordance with local test method SOPs.

The calibration procedures in the test method SOPs comply with the requirements for acceptable calibration practices outlined in the corporate calibration policy, the reference methods, and any applicable regulatory or program requirements.

5.5.3 Equipment Use and Operation

Equipment is operated and maintained by laboratory personnel that are trained on the test method SOP. Up-to-date instructions and procedures for the use and maintenance of analytical equipment are included in SOPs and/or supplemental documents such as standard work instructions (SWI) or instrument manuals which are made readily accessible in the work area to all laboratory personnel.

5.5.4 Equipment Identification

The laboratory uniquely identifies equipment by serial number or any other unique ID system, when practical. The identifier is included in the equipment list maintained by QA.

5.5.5 Equipment Lists and Records

5.5.5.1 Equipment List

The laboratory maintains a master list of equipment that includes information about the equipment including a description, manufacturer, serial number, date placed in service, condition when received, identity, and the current location in the laboratory. The date of purchase is tracked by the procurement record. The equipment list(s) for each location covered by this manual is provided in Appendix F.

5.5.5.2 Equipment Records

In addition to the equipment list, the laboratory maintains records of equipment that include:

- Verification that equipment conforms with specifications.
- Calibration records including dates, results, acceptance criteria, and next calibration dates.
- Maintenance plan and records
- Records of damage, malfunction, or repair

The laboratory follows an equipment maintenance program designed to optimize performance and to prevent instrument failure which is described in individual test method SOPs.

The maintenance program includes routine maintenance activities which are performed as recommended by the manufacturer at the frequency recommended and non-routine maintenance, which is performed to resolve a specific problem such as degradation of peak resolution, shift in calibration relationship, loss of sensitivity, or repeat failure of instrument performance checks and quality control samples.

Maintenance is performed by laboratory personnel or by outside service providers.

All maintenance activities performed by laboratory personnel are recorded by the individual(s) that performed the activity at the time the maintenance was performed in an instrument maintenance log.

The maintenance record minimally includes the date of maintenance, the initials of the person(s) performing maintenance, a description of the activity performed, why (when the maintenance is non-routine), and the return to analytical control. When maintenance is performed by an external vendor, the laboratory staples the service record into hardcopy maintenance logs or scans the record easy retrieval. The laboratory provides unrestricted access to instrument maintenance logs in order to promotes good instrument maintenance and recordkeeping practices.

If an instrument must be moved, the laboratory will use safe practices for handling and transport to minimize damage and contamination.

5.5.6 Out of Service Protocol

Equipment that has been subjected to overloading, mishandling, gives suspect results, has been shown to be defective, or is performing outside of specified limits is taken out of service and either removed from the work area or labeled to prevent accidental use until it has been repaired and verified to perform correctly.

When analytical equipment is taken out of service, the laboratory examines the potential effect it may have had on previous analytical results to identify any non-conforming work. (See section 4.9).

5.5.7 Calibration Status

The laboratory labels support equipment to indicate calibration status, whenever practicable or otherwise maintains the calibration status in a visible location in the work area. These procedures are described in laboratory SOP ENV-SOP-BEAV-0128 *Support Equipment*.

The calibration status of analytical instruments is documented in the analytical record. Analysts verify on-going acceptability of calibration status prior to use and with instrument performance check standards. These procedures are described in test method SOPs.

5.5.8 Returned Equipment Checks

When equipment or instrument is sent out of the laboratory for service, the laboratory ensures that the function and calibration status of the equipment is checked and shown to be satisfactory before the equipment is returned to service. These procedures are outlined in SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.*

5.5.9 Intermediate Equipment Checks

The laboratory performs intermediate checks on equipment to verify the on-going calibration status. For example, most test method require some form of continuing calibration verification check and these procedures are included in the test method SOP. Periodic checks of support equipment are also performed.

5.5.10 Safeguarding Equipment Integrity

The laboratory safeguards equipment integrity using a variety of mechanisms that include but are not limited to:

- Adherence to manufacturer's specification for instrument use so that settings do not exceed manufacturer's recommendation or stress the performance of the equipment.
- Established maintenance programs.
- Transparent maintenance records and unrestricted access to maintenance logs.
- Validation and approval of software before use.
- Audits to confirm instrument settings are consistent with SOPs.
- On-the-job training for safe and proper use of laboratory equipment.

5.6 Measurement Traceability

5.6.1 General

Measurement traceability refers to a property of a measurement result whereby the result can be related to a reference through an unbroken chain of calibration, each contributing to the measurement uncertainty. Traceability requires an established calibration hierarchy of equipment (instruments) used during testing including equipment used for subsidiary measurements. The laboratory assures this equipment is calibrated prior to being put into service and that the reference standard and materials used for calibration are traceable to the international standard of units (SI) or national measurement standard.

When strict traceability to SI units cannot be made, the laboratory establishes traceability with the use of reference standards and equipment obtained from competent supplier that provide calibration certificates and/or certificates of analysis (COA).

5.6.2 Equipment Correction Factors

When correction factors are used to adjust results the laboratory will assure that results in computer software are also updated. For example, if the direct instrument or reading output must be corrected based on preparation factor or concentration factors, laboratory management will assure the corrected result is also updated in the software, whenever possible.

5.6.3 Specific Requirements

5.6.3.1 Requirements for Calibration Laboratories

The laboratory does not offer calibration services to customers.

5.6.3.2 Requirements for Testing Laboratories

The laboratory has procedures in place to verify equipment is calibrated prior to being put into service. (See 5.5.2) and ensures the reference standard and materials used for calibration are traceable to the international standard of units (SI) or national measurement standard. When strict traceability to SI units cannot be made, the laboratory establishes traceability with the use of reference standards and equipment obtained from competent suppliers that provide calibration certificates and/or certificates of analysis (COA).

5.6.4 Reference Standards and Reference Materials

5.6.4.1 Reference Standards

The laboratory uses reference standards of measurement to verify adequacy of working weights and thermometers. The working weight is the weight(s) used for daily balance calibration checks and the working thermometers are used for temperature measurements on a daily basis.

Intermediate checks of the working reference measurement standards are performed to verify adequacy between calibration from an external calibration laboratory. The measurements from working weights and thermometers are compared to measurement taken by the reference standard which is traceable to SI or a national standard. The reference weights and thermometers are used solely for verification

purposes unless the laboratory can prove that daily use does not adversely affect performance of the reference standard.

The laboratory performs intermediate checks of the working weights at least annually.

Working thermometers (glass and digital) are checked against the reference thermometer prior to placement in service to establish a correction factor and then rechecked annually (glass) or quarterly (digital) thereafter.

The calibration of liquid in glass reference thermometers is verified every 5 years and the calibration of digital reference thermometers is verified annually by an ISO/IEC 17025 accredited calibration laboratory or service provider that provides traceability to a national standard.

The calibration of the reference weight(s) is verified every 5 years by an ISO/IEC 17025 accredited calibration laboratory.

If criteria for the intermediate checks or recertification is not acceptable, the impact on previously reported results is evaluated using the process for evaluation of nonconforming work (See 4.9)

See laboratory Support Equipment SOP for more information about this process.

5.6.4.2 Reference Materials

The laboratory purchases chemical reference materials used (also known as stock standards) from vendors that are accredited to ISO 17034 or Guide 34. Purchased reference materials must be received with a Certificate of Analysis (COA) where available. If a reference material cannot be purchased with a COA, it must be verified by analysis and comparison to a certified reference material and/or there must be a demonstration of capability for characterization. COA are reviewed for adequacy and retained by the laboratory for future reference.

The laboratory procedure for traceability and use of these materials is provided in the laboratory SOP regarding Pace Standards and Traceability.

This SOP includes each of the following requirements:

- Procedures for documentation of receipt and tracking. The record of entry includes name of the material, the lot number, receipt date, and expiration date.
- Storage conditions and requirements. Reference materials must be stored separately from samples, extracts, and digestates.
- Requirements to assure that preparations of intermediate or working solutions are recorded and assigned a unique identification number for tracking. Records of preparation include the lot number of the stock standard(s) used, the type and lot number of the solvent, the formulation, date, expiration date, and the preparer's initials. The lot number of the working standards is recorded in the analytical record to provide traceability to the standard preparation record. The preparation record provides traceability to the COA, which is traceable to SI or the national measurement standard.

- A requirement that the expiration dates of prepared standards may not exceed the expiration date of the parent standard. Standards, reference materials, and reagents are not used after their expiration dates unless their reliability is thoroughly documented and verified by the laboratory. If a standard exceeds its expiration date and is not re-certified, the laboratory removes the standard and/or clearly designates it as acceptable for qualitative/troubleshooting purposes only. All prepared standards, reference materials, and reagents are verified to meet the requirements of the test method through routine analyses of quality control samples.
- The second source materials used for verification of instrument calibration are obtained from a different manufacturer or different lot from the same manufacturer.
- Procedures to check reference materials for degradation and replacement of material if degradation or evaporation is suspected.
- Procedures for labeling. At a minimum the container must identify the material, the ID of the material and the expiration date. Original containers should also be labeled with date opened.

5.6.4.3 Intermediate Checks

Checks to confirm the calibration status of standards and materials are described in laboratory SOPs. These checks, include use of second source standards and reference materials reserved only for the purpose of calibration checks.

5.6.4.4 Transport and Storage

The laboratory handles and transports reference standards and materials in a manner that protects the integrity of the materials. Reference standard and material integrity is protected by separation from incompatible materials and/or minimizing exposure to degrading environments or materials. Standards and reference materials are stored separately from samples, extracts, and digestates. All standards are stored according to the manufacturer's recommended conditions. Temperatures colder than the manufacturer's recommendation are acceptable if it does not compromise the integrity of the material (e.g. remains in liquid state and does not freeze solid). In the event a standard is made from more than a single source with different storage conditions, the standard will be stored according to the conditions specified in the analytical method.

See the applicable analytical SOPs for specific reference material storage and transport protocols.

5.7 Sampling

Sampling refers to the field collection of samples and to subsamples taken by the laboratory for analysis from the field collected sample.

Subsampling procedures are included in each test method SOP or a stand-alone SOP to assure the aliquot used for testing is representative of the field collected sample.

The requirements in the following subsections apply when field sampling is performed by the laboratory.

5.7.1 Sampling Plans and SOPs

When the laboratory performs field collection of samples, sampling is carried out in accordance with a written sample plan prepared by the customer or by the laboratory and by relevant sampling SOPs. These documents are made readily accessible at the sampling location. Sampling plans and SOPs are, whenever reasonable, based on appropriate governing methods and addresses the factors to be controlled to ensure the validity of the analytical results.

5.7.2 Customer Requested Deviations

When the customer requires deviations, additions, or exclusions from the documented laboratory sampling plan and/or procedure, the laboratory records the client's change request in detail with the sampling record, communicates the change to sampling personnel, and includes this information in the final test report.

5.7.3 Recordkeeping

The laboratory assures the sampling record includes the sampling procedure used, any deviations from the procedure, the date and time of sampling, the identification of the sampler, environmental conditions (if relevant), and the sampling location.

5.8 Sample Management & Handling

5.8.1 Procedures

The laboratory's procedures for sample management and handling are outlined in the laboratory SOP ENV-SOP-BEAV-0125 *Sample Acceptance Criteria*, or equivalent subsequent revision.

The procedures in these SOPs are established to maintain the safe handling and integrity of samples from transport, storage, to disposal and during all processing steps in-between; to maintain client confidentiality, and to protect the interests of PAS and its customers.

5.8.1.1 Chain of Custody

All samples received by the laboratory must be accompanied with a Chain of Custody (COC) record. The COC provides information about the samples collected and submitted for testing and documents the possession of samples from time of collection to receipt by the laboratory.

The COC record must minimally include the following information:

- Client name, address, phone number
- Project Reference
- Client Sample Identification (Client ID)
- Date, Time, and Location of Sampling
- Samplers Name or Initials
- Matrix

- Type of container, and total number collected each sample
- Preservatives
- Analyses Requested
- Mode of collection
- Any special instructions
- The date and time and signature of each sample transfer from time of collection to receipt in the laboratory. When the COC is transported inside the cooler, independent couriers do not sign the COC. Shipping manifests and/or air bills are the records of possession during transport.

A complete and legible COC is required. If the laboratory observes that the COC is incomplete or illegible, the client is contacted for resolution. The COC must be filled out in indelible ink. Personnel correct errors by drawing a single line through the initial entry so the entry is not obscured, entering the correct information, and initialing, and dating the change.

5.8.1.2 Legal Chain of Custody

Legal chain of custody is a chain of custody protocol used for evidentiary or legal purposes. The protocol is followed by the laboratory when requested by customer or where mandated by a regulatory program.

Legal chain of custody (COC) protocol establishes an intact, continuous record of the physical possession*, storage, and disposal of "samples" which includes, sample aliquots, and sample extracts/digestates/distillates.

Legal COC records account for all time periods associated with the samples, and identifies all individuals who physically handled individual samples. Legal COC begins at the point established by legal authority, which is usually at the time the sample containers are provided by the laboratory for sample collect or when sample collection begins.

*A sample is in someone's custody if:

- It is in one's physical possession;
- It is in one's view after being in one's physical possession;
- It has been in one's physical possession and then locked or sealed so that no one can tamper with it; and/or
- It is kept in a secure area, restricted to authorized personnel only.

5.8.2 Unique Identification

Each sample is assigned a unique identification number by the laboratory (Lab ID) after the sample has been checked and accepted by the laboratory in accordance with the laboratory's sample acceptance policy (See 5.8.3). The Lab ID is affixed to the sample container using a durable label.

The unique identification of samples also applies to subsamples, and prepared samples, such as extracts, digestates, etc.

The lab ID is linked to the field ID (client ID) in the laboratory's record. Both IDs are linked to the testing activities performed on the sample and the documentation records of the test.

Also see 5.8.4.

5.8.3 Sample Receipt Checks and Sample Acceptance Policy

The laboratory checks the condition and integrity of samples on receipt and compares the labels on the sample containers to the COC record. Any problem or discrepancy is recorded. If the problem impacts the suitability of the sample for analysis or if the documentation is incomplete, the client is notified for resolution. Decisions and instructions from the client are maintained in the project record.

5.8.3.1 Sample Receipt Checks

The following checks are performed:

- Verification that the COC is complete and legible.
- Verification that each sample's container label includes the client sample ID, the date and time of collection and the preservative in indelible ink.
- The container type and preservative is appropriate for each test requested.
- Adequate volume is received for each test requested.
- Visual inspection for damage or evidence of tampering.
- Visual inspection for presence of headspace in VOA vials. (VOA = volatile organic analysis).
- Thermal Preservation: For chemical testing methods for which thermal preservation is required, temperature on receipt is acceptable if the measurement is above freezing but <6°C. For samples that are hand-delivered to the laboratory immediately after sample collection, there must be evidence that the chilling process has begun, such as arrival on ice. The requirements for thermal preservation vary based on the scope of testing performed. For example, for microbiology, temperature on receipt is acceptable if the measurement is <10°C. Refer to the laboratory's SOP for sample receipt for more information.
- Chemical Preservation
- Holding Time: Sample receiving personnel are trained to recognize tests with tests where the holding time is 48 hours or less and to expedite the log-in of these samples. Except for tests with immediate holding times (15 minutes from time of collection or less), when samples are received out of hold, the laboratory will notify the client and request instruction. If the decision is made to proceed with analysis, the final test report will include notation of this instruction.

5.8.3.2 Sample Acceptance Policy

The laboratory maintains a sample acceptance policy in accordance with regulatory guidelines to clearly establish the circumstances in which sample receipt is accepted or rejected. When receipt does not meet acceptance criteria for any one of these conditions, the laboratory must document the noncompliance, contact the customer, and either reject the samples or fully document any decisions to proceed with testing. In accordance with regulatory specifications, test results associated with receipt conditions that do not meet criteria are qualified in the final test report.

All samples received must meet each of the following:

- Be listed on a complete and legible COC.
- Be received in properly labeled sample containers.
- Be received in appropriate containers that identify preservative.
- The COC must include the date and time of collection for each sample.
- The COC must include the test requested for each sample.
- Be in appropriate sample containers with clear documentation of the preservatives used.
- Be received within holding time. Any samples received beyond the holding time will not be processed without prior customer approval.
- Have sufficient sample volume to proceed with the analytical testing. If insufficient sample volume is received, analysis will not proceed without customer approval.
- Be received within appropriate temperature ranges (not frozen but ≤6°C) unless program requirements or customer contractual obligations mandate otherwise. The cooler temperature is recorded directly on the COC. Samples that are delivered to the laboratory immediately after collection are considered acceptable if there is evidence that the chilling process has been started. For example, by the arrival of the samples on ice. If samples arrive that are not compliant with these temperature requirements, the customer will be notified. The analysis will NOT proceed unless otherwise directed by the customer. If less than 72 hours remain in the hold time for the analysis, the analysis may be started while the customer is contacted to avoid missing the hold time. Data associated with any deviations from the above sample acceptance policy requirements will be appropriately qualified.

5.8.4 Sample Control and Tracking

The samples are controlled and tracked using the Laboratory Information Management System (LIMS). The LIMS stores information about the samples and project. The process of entering information into the LIMS is called login. After log-in, a label is generated and affixed to each sample container. Information on this label, such as the lab ID, links the sample container to the information in LIMS.

At a minimum, the following information is entered during log-in:

- Client Name and Contact Information;
- The laboratory ID linked to the client ID;
- Date and time of sample collection;
- Date and time of sample receipt;
- Matrix;
- Tests Requested.

5.8.5 Sample Storage, Handling, and Disposal

The laboratory procedures for sample storage, handling and disposal are detailed in laboratory SOP ENV-SOP-BEAV-0075, or equivalent subsequent replacement.

5.8.5.1 Sample Storage

The samples are stored according to method and regulatory requirements as per test method SOPs. Samples are stored away from all standards, reagents, or other potential sources of contamination and stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

Refrigerated storage areas are maintained at ≤6°C (but not frozen) and freezer storage areas are maintained at <-10°C (unless otherwise required per method or program). The temperature of each storage area is checked and documented at least once for each day of use. If the temperature falls outside the acceptable limits, then corrective actions are taken and appropriately documented.

The laboratory is operated under controlled access protocols to ensure sample and data integrity. Visitors must register at the front desk and be properly escorted at all times. Samples are taken to the appropriate storage location immediately after sample receipt and login procedures are completed. All sample storage areas have limited access. Samples are removed from storage areas by designated personnel and returned to the storage areas as soon as possible after the required sample quantity has been taken.

5.8.5.2 Sample Retention and Disposal

The procedures used by the laboratory for sample retention and disposal are detailed in laboratory SOP ENV-SOP-BEAV-0075, or equivalent subsequent replacement.

In general, unused sample volume and prepared samples such as extracts, digestates, distillates and leachates (samples) are retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

Samples may be stored at ambient temperature when all analyses are complete, the hold time is expired, the report has been delivered, and/or when allowed by the customer or program. Samples requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at

ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposition of hazardous samples is to return the excess sample to the customer.

5.9 Assuring the Quality of Test Results

5.9.1 Quality Control (QC) Procedures

The laboratory monitors the validity and reliability of test results using quality control (QC) samples that are prepared and analyzed concurrently with field samples in the same manner as field samples. QC results are always associated to and reported with the field samples they were prepared and analyzed with from the same preparation or analytical batch. See the glossary for definition of preparation and analytical batch.

The results of QC performed during the testing process are used by the laboratory to assure the results of analysis are consistent, comparable, accurate, and/or precise within a specified limit. When the results are not within acceptance criteria or expectations for method performance, correction and corrective action(s) are taken. These actions may include retesting or reporting of data with qualification to alert the end user of the situation.

Other QC measures performed include the use of certified reference materials (see 5.6.2), participation in interlaboratory proficiency testing (see 5.9.1.1), verification that formulae used for reduction of data and calculation of results is accurate (see 5.9.3), on-going monitoring of environmental conditions that could impact test results (see 5.3.2), and evaluation and verification of method selectivity and sensitivity (see 5.4.5).

QC results are also used by the laboratory to monitor performance statistical trends over time and to establish acceptance criteria when no method or regulatory criteria exist. (see 5.9.1.4).

5.9.1.1 Essential QC

Although the general principles of QC for the testing process apply to all testing, the QC protocol used for each test depends on the type of test performed.

QC protocol used by the laboratory to monitor the validity of the test are specified in test method SOPs. The SOP includes QC type, frequency, acceptance criteria, corrective actions, and procedures for reporting of nonconforming work.

These requirements in the SOP conform to the reference method and any applicable regulations or certification and accreditation program requirement for which results of the test are used. When a project requires more stringent QC protocol than specified in the SOP, project specification is followed. When the project requires less stringent QC protocol, the project specification may be followed as an authorized departure from the SOP when the project specifications meet the requirements in the mandated method and any regulatory compliance requirements for which the data will be used.

The following are examples of essential QC for Chemistry:

5.9.1.1.1 Second Source Standard (ICV/QCS)

The second source standard is a standard obtained from a different vendor than the vendor of the standards used for calibration. It is a positive control used to verify the accuracy of a new calibration relative to the purity of the standards used for calibration. This check is referred to in test method and quality system standards as the initial calibration verification (ICV) or quality control sample (QCS). The second source standard is analyzed immediately after the calibration and before analysis of any samples. When the ICV is not within acceptance criteria, a problem with the purity or preparation of the standards may be indicated.

5.9.1.1.2 Continuing Calibration Verification (CCV)

CCV is to determine if the analytical response has significantly changed since initial calibration. If the response of the CCV is within criteria, the calibration is considered valid. If not, there is a problem that requires further investigation. Actions taken are technology and method specific.

5.9.1.1.3 Method Blank (MB) / Other Blanks

A method blank is a negative control used to assess for contamination during the prep/analysis process. The MB consists of a clean matrix, similar to the associated samples that is known to be free of analytes of interest. The MB is processed with and carried through all preparation and analytical steps as the associated samples.

In general, contamination is suspected when the target analyte is detected in the MB above the reporting limit. Some programs may require evaluation of the MB to ½ the reporting limit or the detection limit. When contamination is evident, the source is investigated and corrections are taken to reduce or eliminate it. Analytical results associated with MB that does not meet criteria are qualified in the final test report.

Other types of blanks that serve as negative controls in the process may include:

- Trip Blanks (VOA)
- Storage Blanks
- Equipment Blanks
- Field Blanks
- Calibration Blanks
- Cleanup Blanks
- Instrument Blanks

5.9.1.1.4 Laboratory Control Sample (LCS)

The LCS is positive control used to measure the accuracy of process in a blank matrix. The LCS is spiked by the laboratory with a known amount of analyte. The spike is a standard solution that is pre-made or prepared from a certified reference standard. The LCS is processed with and carried through all preparation and analytical steps as the associated samples.

When the percent recovery (%R) of the LCS is within the established control limit, sufficient accuracy has been achieved. If not, the source of the problem is investigated and corrected and the procedure may be repeated. Analytical results associated with LCS that does not meet criteria are qualified in the final test report.

5.9.1.1.5 Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

Matrix spikes measures the effect the sample matrix has on precision and accuracy of the determinative test method. The MS and MSD are replicates of a client sample that is spiked with known amount of target analyte.

Due to the heterogeneity of matrices even of the same general matrix type, matrix spike results mostly provide information on the effect of the matrix to the client whose sample was used and on samples of the same matrix from the same sampling site. Therefore, MS should be client-specific when the impact of matrix on accuracy and precision is a project data quality objective. When there is not a client-specified MS for any sample in the batch, the laboratory randomly selects a sample from the batch; the sample selected at random is called a "batch" matrix spike.

The MS/MSD results for percent recovery and relative percent difference are checked against control limits. Because the performance of matrix spikes is matrix-dependent, the result of the matrix spike is not used to determine the acceptability of the test.

5.9.1.1.6 Sample Duplicate (SD)

A sample duplicate is a second replicate of sample that is prepared and analyzed in the laboratory along another replicate. The SD is used to measure precision.

The relative percent difference between replicates are evaluated against the method or laboratory derived criteria for relative percent difference (RPD), when this criterion is applicable. If RPD is not met, associated test results are reported with qualification.

5.9.1.1.7 Surrogates

Surrogates are compounds that mimic the chemistry of target analytes but are not expected to occur naturally in real world samples. Surrogates are added to each sample and matrix QC

samples (MS, MSD, SD) at known concentration to measure the impact of the matrix on the accuracy of method performance. Surrogates are also added to the positive and negative control samples (MB, LCS) to evaluate performance in a clean matrix, and included in the calibration standards and calibration check standards.

The percent recovery of surrogates is evaluated against method-specified limits or statistically derived in-house limits. Project-specific limits and/or program-specific limits are used when required. Results with surrogate recovery out of limits in samples are reported with qualification. Samples with surrogate failures can also be re-extracted and/or re-analyzed to confirm that the out-of-control value was caused by the matrix of the sample and not by some other systematic error.

5.9.1.1.8 Internal Standards

Internal Standards are compounds not expected to occur naturally in field samples. They are added to every standard and sample at a known concentration prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes. The laboratory follows specific guidelines for the treatment of internal standard recoveries and further information can be found in the applicable laboratory SOP.

5.9.1.1.9 QC Acceptance Criteria and Control Limits

The QC acceptance criteria are specified in test method SOPs. The criteria in the SOP are based on the requirements in the published test method or regulatory program. When there are no established acceptance criteria, the laboratory develops acceptance criteria in accordance with recognized industry standards.

Some methods and programs require the laboratory to develop and use control limits for LCS, MS/MSD and surrogate evaluation. In laboratory developed limits are referred to as "in-house" control limits. In-house control limits represent ± 3 Standard Deviations (99% confidence level) from the average recovery of at least 20 data points generated using the same preparation and analytical procedure in a similar matrix.

See laboratory SOP ENV-SOP-BEAV-0117 or equivalent subsequent revision for more information.

5.9.1.2 Proficiency Testing (PT)

The laboratory participates in interlaboratory proficiency testing (PT) studies to measure performance of the test method and to identify or solve analytical problems. PT samples measure laboratory performance through the analysis of unknown samples provided by an external source.

The PT samples are obtained from accredited proficiency testing providers (PTP) and handled as field samples which means they are included in the laboratory's normal analytical processes and do not receive extraordinary attention due to their nature.

The laboratory does not share PT samples with other laboratories, does not communicate with other laboratories regarding current PT sample results during the duration of the study, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

The laboratory initiates an investigation and corrective action plan whenever PT results are deemed unacceptable by the PT provider.

The frequency of PT participation is based on the certification and accreditation requirements held by the laboratory.

5.9.2 QC Corrective Action

When the results of QC are not within acceptance criteria or expectations for method performance, correction and corrective action(s) are taken per the specifications in the test method SOP. These actions may include retesting or reporting of data with qualification to alert the end user of the situation.

5.9.3 Data Review

The laboratory uses a tiered system for data review. The tiered process provides sequential checks to verify data transfer is complete; manual calculations, if performed, are correct, manual integrations are appropriate and documented, calibration and QC requirements are met, appropriate corrective action was taken when required, test results are properly qualified, process and test method SOPs were followed, project specific requirements were met, when applicable, and the test report is complete.

The sequential process includes three tiers referred to as primary review, secondary review, and administrative/completeness review.

Detailed procedures for the data review process are described in laboratory SOP ENV-SOP-BEAV-0118 or equivalent subsequent revision. The general expectations for the tiered review process are described in the following sections:

5.9.3.1 Primary Review

Primary review is performed by the individual that performed the task. All laboratory personnel are responsible for review of their work product to assure it is complete, accurate, documented, and consistent with policy and SOPs.

Checks performed during primary review include but are not limited to:

- Verification that data transfer and acquisition is complete
- Manual calculations, if performed, are documented and accurate
- Manual integrations, if performed, are documented and comply with SOP ENV-SOP-CORQ-006 *Manual Integration*

- Calibration and QC criteria were met, and/or proper correction and corrective actions were taken, and data and test results associated with QC and criteria exceptions are properly qualified
- Work is consistent with SOPs and any other relevant instructional document such as SWI, program requirements, or project QAPP

5.9.3.2 Secondary Review

Secondary review is performed by qualified peer or supervisor. Secondary review is essentially a repeat of the checks performed during primary review by another person. In addition to the checks of primary review, secondary review includes chromatography review to check the accuracy of quantitative analyte identification.

5.9.3.3 Completeness Review

Completeness review is an administrative review performed prior to release of the test report to the customer. Completeness review verifies that the final test report is complete and meets project specification. This review also assures that information necessary for the client's interpretation of results are explained in the case narrative or footnoted in the test report.

5.9.3.4 Data Audits

In addition to the 3 tier data review process, test reports may be audited by local QA to verify compliance with SOPs and to check for data integrity, technical accuracy, and regulatory compliance. These audits are not usually done prior to issuance of the test report to the customer. The reports chosen for the data audits are selected at random.

If any problems with the data or test results are found during the data audit, the impact of the nonconforming work is evaluated using the process described in Section 4.9.

Also see Section 4.14 for internal audits.

5.10 Reporting

5.10.1 General Requirements

The laboratory reports results of testing in a way that assures the results are clear, and unambiguous. All data and results are reviewed prior to reporting to assure the results reported are accurate and complete.

Test results are summarized in test reports that include all information necessary for the customer's interpretation of the test results. Additional information necessary to clarify the data or disclose nonconformance, exceptions, or deviations that occurred during the analytical process are also reported to the customer in the test report.

The specifications for test reports and electronic data deliverables (EDD) are established between the laboratory and the customer at the time the request for analytical services is initiated. The report specifications include the test report format, protocol for the reporting limit (RL), conventions for the reporting of results less than the limit of quantitation (LOQ), and specification for the use of project or program specific data qualifiers. Information about review of analytical service requests is provided in Section 4.4.

5.10.2 Test Reports: Required Items

Test Reports are prepared by the laboratory at the end of the testing process. The format of the report depends on the level of reporting requested by the customer. The laboratory offers a variety of standardized test report formats and can also can provide custom test report formats, when necessary.

The level of detail required in the test report depends on the customer's needs for data verification, validation, and usability assessments that occur after the laboratory releases the test report to the customer. The test report formats offered by the laboratory provide gradient levels of detail to meet the unique needs of each customer. The laboratory project manager helps the customer select the test report format that best meets their needs. When a specific report format or protocol is required for a regulatory or program compliance, the laboratory project manager must ensure the test report selected meets those requirements.

Every test report issued by the laboratory includes each of the following items:

a) Title

b) Name and phone number of a point of contact from the laboratory issuing the report.

c) Name and address of the laboratory where testing was performed. When testing is done at multiple locations within network (IRWO), the report must clearly identify which network laboratory performed each test and must include the physical address of each laboratory.

d) Unique identification of the test report and an identifier on each page of the report to link each page to the test report and clear identification of the end of the report.

e) The name and address of the customer

f) Identification of test methods used

g) Cross reference between client sample identification number (Sample ID) and the laboratory's identification number for the sample (Lab ID) to provide unambiguous identification of samples.

h) The date of receipt of samples, condition of samples on receipt, and identification of any instance where receipt of the samples did not meet sample acceptance criteria.

i) Date and times of sample collection, receipt, preparation, and analysis.

j) Test results and units of measurement, and qualification of results associated with QC criteria exceptions, and identification of reported results outside of the calibration range.

k) Name, title, signature of the person(s) authorizing release of the test report and date of release.

l) A statement that the results in the test report relate only to the items tested.

m) Statement that the test report may not be reproduced except in full without written approval from the laboratory.

5.10.3 Test Reports: Supplemental Items

5.10.3.1 Supplemental Requirements

The following items are included in the test report when required or relevant:

a) Explanation of departure from test method SOPs including, what the departure was and why it was necessary.

b) Statistical methods used. (Required for Whole Effluent Toxicity)

c) For solid samples, specification that results are reported on a dry weight or wet weight basis.

d) Signed Affidavit, when required by client or regulatory agency.

e) A statement of compliance / non-compliance with requirements or specifications (client, program, or standard) that includes identification of test results that did not meet acceptance criteria.

f) When requested by the client, statement of estimated measurement uncertainty. In general, for environmental testing, estimated uncertainty of measurement is extrapolated from LCS control limits. Control limits incorporate the expected variation of the data derived from the laboratory's procedure. When the control limits are specified by the test method or regulatory program, the control limits represent the expected variation of the test method and/or matrices for which the test method was designed.

g) Opinions and Interpretations.

h) If a claim of accreditation/certification is included in the test report, identification of any test methods or analytes for which accreditation/certification is not held by the laboratory if the accrediting body offers accreditation/certification for the test method/analyte. The fields of accreditation/certification vary between agencies and it cannot be presumed that because accreditation/certification is not held that it is offered or required.

i) Certification Information, including certificate number and issuing body.

5.10.3.2 Test Reports: Sampling Information

The following items are included in the test report when samples are collected by the laboratory or when this information is necessary for the interpretation of test results:

a) Date of Sampling.

b) Unambiguous identification of material samples.

c) Location of sampling including and diagrams, sketches, or photographs.

d) Reference to the sampling plan and procedures used.

e) Details of environmental conditions at time of sample that may impact test results.

f) Any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned.

5.10.4 Calibration Certificates

The laboratory does not perform calibration activities for its customers and calibration certificates are not offered or issued.

5.10.5 Opinions and Interpretations

The laboratory provides objective data and information to its customers of sufficient detail for their interpretation and decision making. Objective data and information is based solely on fact and does not attempt to explain the meaning (interpret) or offer a view or judgement (opinion). Sometimes the customer may request the laboratory provide opinion or interpretation to assist them with their decisions about the data.

When opinions and interpretations are included in the test report, the laboratory will document the basis upon which the opinions and interpretations have been made and clearly identify this content as opinion or interpretation in the test report.

Examples of opinion and interpretation include but are not limited to:

- The laboratory's viewpoint on how a nonconformance impacts the quality of the data or usability of results.
- The laboratory's judgment of fulfillment of contractual requirements.
- Recommendations for how the customer should use the test results and information.
- Suggestions or guidance to the customer for improvement.

When opinions or interpretations are verbally discussed with the customer, the content of these conversations is summarized by the laboratory and kept in the project record.

5.10.6 Subcontractor Reports

When analytical work has been subcontracted to an organization external to PAS, the test report from the subcontractor is included in its entirety as an amendment to the final test report.

Note: Test results for analytical work performed within the PAS network may be are merged into a single test report. The test report issued clearly identifies the location and address of each network location that performed testing and which tests they performed. (See 5.10.2)

5.10.7 Electronic Transmission of Results

When test results and/or reports are submitted to the customer through electronic transmission, follow the procedures established in this manual for confidentiality and protection of data.

5.10.8 Format of Test Reports

The test formats offered by the laboratory are designed to accommodate each type of analytical test method carried out by the laboratory and to minimize the possibility of misunderstanding or misuse of analytical results. The format of electronic data deliverables (EDD) follow the specifications for the EDD.

5.10.9 Amendments to Test Reports

Test reports that are revised or amended by the laboratory after date of release of the final test report to the customer are issued as a new test report that is clearly identified as an amendment or revision and that includes a reference to the originally issued final test report.

The customer is the organization doing business with PAS external to PAS.

Changes made to test results and data before the final test report is issued to the customer are not amendments or revisions, these are corrections to errors found during the laboratory's data verification and review process.

6.0 REVISION HISTORY

This Version:

Section	Description of Change
All	This version is a complete rewrite of the document this version supersedes.

This document supersedes the following documents:

Document Number	Title	Version
ENV-MAN-CORQ-0001	Quality Manual	00

7.0 APPENDICES

7.1 Appendix A: Certification / Accreditation Listing

The certifications / accreditation lists provided in this manual represent those that were held by the named location on the effective date of this manual. This information is subject to change without notice and must not be considered valid proof of certification or accreditation status. Current certificates are maintained by Local QA and a copy of the certificate is posted to PAS's eDMS Portal for access by all PAS employees. External parties should contact the laboratory for the most current information.

7.1.1 PAS - Beaver

Accrediting Authority	Program Category	Accrediting Agency	Certificate Number
Virginia (Primary TNI)	DW, NPW, SCM	DGS (VELAP)	10095
Virginia	DW	DCLS	10460
West Virginia	NPW, SCM	WV DEP	060
West Virginia	DW	WV DHHR	00412CM
Pennsylvania (Secondary TNI)	NPW, SCM	PA DEP	15
North Carolina	NPW	NC DEQ	466
Kentucky	NPW	KY DEP	90039

7.1.2 PAS - Lexington

Accrediting Authority	Program Category	Accrediting Agency	Certificate Number
Virginia (Primary TNI)	DW, NPW, SCM	DGS (VELAP)	10692

7.1.3 PAS - Morgantown

Accrediting Authority	Program Category	Accrediting Agency	Certificate Number
West Virginia	NPW	WV DEP	387
West Virginia	DW	WV DHHR	00312M

7.2 Appendix B: Capability Listing

The capabilities listed in this Appendix were held by the location referenced on the effective date of this manual. This information is subject to change without notice. External parties should contact the laboratory for the most current information.

Table Legend:

- DW = Drinking Water
- NPW = Non-Potable Water
- SCM = Solid and Chemical Materials
- Waste = Non-Aqueous Phase Liquid (NAPL), Oil
- Tissue = Biota and Tissue

7.2.1 PAS - Beaver

Parameter	Method	Matrices							
		Air	DW	NPW	SCM	Waste	Tissue		
Acidity	SM 2310 B			X					
Alkalinity	SM 2320 B			X					
Ammonia	EPA 350.1			X					
Ammonia	SM 4500-NH3 B			X	X				
Ammonia	SM 4500-NH3 C			X	X				
Anions	EPA 300.0		X	X	X				
Anions	SW 9056 A				X				
Nitrate, Nitrite, Nitrate-Nitrite	SM 4500-NO3 F			X	X				
Nitrate-Nitrite	Lachat 10-107-04-1-C		X	X					
Nitrate-Nitrite	SM 4110 B			X					
Carbon, Total Organic (TOC)	SM 5310 C			X					
Carbon, Total Organic (TOC)	SW 9060			X					
Chlorine, Residual	SM 4500-Cl G			X					
Chromium VI, Dissolved	EPA 218.6			X					
Chromium VI, Dissolved	SM 3500-Cr C			X					
Chromium VI, Dissolved	SW 3060 A				X				
Chromium VI, Dissolved	SW 7196 A				X				
Color	SM 2120 B			X					
Color	SM 2120 E			X					
Conductivity, Specific	SM 2510 B			X					
Cyanide, Amenable	SM 4500-CN E			X					

Parameter	Method	Matrices							
		Air	DW	NPW	SCM	Waste	Tissue		
Cyanide, Amenable	SM 4500-CN G			X					
Cyanide, Total	EPA 335.4		X	X	X				
Cyanide, Total	SW 9010 B			X					
Cyanide, Total	SW 9010 C				X				
Cyanide, Total	SW 9012 B			X	X				
Cyanide, WAD	SM 4500-CN E			X					
Cyanide, WAD	SM 4500-CN I			X					
Hardness, Calcium	SM 2340 B			X					
Hardness, Total	SM 2340 B			X					
TKN	EPA 351.2			X	X				
Oil & Grease	EPA 1664 A			X					
BOD	SM 5210 B			X					
COD	SM 5210 B			X					
Dissolved Oxygen	Hach 10360			X					
Dissolved Oxygen	SM 4500-O C			X					
Dissolved Oxygen	SM 4500-O G			X					
pH	SM 4500-H B			X					
pH	SW 9040 C			X	X				
pH	SW 9045 D				X				
Phenolics, Total	EPA 420.1			X					
Phosphorus, Total	SM 4500-P B(5)			X					
Phosphorus, Total	SM 4500-P e			X					
TDS	SM 2540 C			X					
Settleable Solids	SM 2540 F			X					
TSS	SM 2540 D			X					
TVS	SM 2540 E			X					
Total Solids	SM 2540 B			X					
TFS & TVS	SM 2540 G				X				
Sulfide	SM 4500-S F			X					
Sulfite	SM 4500-SO3 B			X					
Surfactants (MBAS)	SM 5540 C			X					
Turbidity	EPA 180.1			X					

Parameter	Method	Matrices							
		Air	DW	NPW	SCM	Waste	Tissue		
ICP Metals	EPA 200.7		X	X					
ICP Metals	SW 6010 C			X	X				
ICP-MS Metals	EPA 200.8		X	X					
ICP-MS Metals	SW 6020 B			X					
Mercury	EPA 1631 E			X					
Mercury	EPA 245.1		X	X					
Mercury	EPA 245.7			X					
Mercury	SW 7470 A			X	X				
Mercury	SW 7471 A				X				
Mercury	SW 7471 B				X				
Selenium	SM 3114 B (Modified)			X					
Selenium	SW 7742 (Modified)				X				
TCLP Leach (Metals & Organics)	EPA 1311					X			
Flashpoint	EPA 1010 A					X			
Corrosivity	SW 9045 D					X			
Paint Filter Test	SW 9095 B					X			
Coliform, Fecal (MF)	SM 9222 D			X	X				
Coliform, Fecal (MPN)	Colilert 18			X					
Coliform, Total (MPN)	Colilert 18			X					
Total Coliforms (P/A)	SM 9223 B		X						
Total Coliforms (MPN)	SM 9223 B		X						
E. Coli (MPN)	Colilert 18			X					
E. Coli (MPN)	SM 9223 B			X					
E. Coli (P/A)	SM 9223 B		X						
E. Coli (MPN)	SM 9223 B		X						
HPC	Simplate		X						
Halogenated & Aromatic Volatiles	SW 8021 B			X					
Purgeable Aromatic Volatiles	EPA 602			X					
Purgeable Volatiles	EPA 624.1			X					
TPH – GRO	SW 8015 C			X	X				
Volatile Organic Compounds	SW 8260 B			X	X				
Volatile Organic Compounds	EPA 524.2		X						

Parameter	Method	Matrices							
		Air	DW	NPW	SCM	Waste	Tissue		
Haloacetic Acids	EPA 552.2		X						
Base/Neutrals & Acid Semi-Volatiles	EPA 625.1			X					
EDB & DBCP	SW 8011			X					
EDB & DBCP	EPA 504.1		X						
Florisil Cleanup	SW 3620 C			X	X				
Glycols	SW 8015 C			X	X				
Organochlorine Pesticides	SW 8081 B			X	X				
Organochlorine Pesticides & PCBs	EPA 608.3			X					
Phenols	EPA 604			X					
Polychlorinated Biphenyls	SW 8082 / 8082 A			X	X				
Semi-Volatile Organic Compounds	SW 8270 D			X	X				
Sulfur Cleanup	SW 3660 B			X	X				
Sulfuric Acid/Permanganate Cleanup	SW 3665 A			X	X				
TPH – DRO/ORO/KRO	SW 8015 C			X	X				
Acute – Ceriodaphnia dubia	EPA 821-R-02-012 2002.0			X					
Acute – Daphnia Magna	EPA 821-R-02-012 2021.0			X					
Acute – Daphnia pulex	EPA 821-R-02-012 2021.0			X					
Acute – Fathead Minnow	EPA 821-R-02-012 2000.0			X					
Chronic – Ceriodaphnia dubia	EPA 821-R-02-013 1002.0			X					
Chronic – Fathead Minnow	EPA 821-R-02-013 1000.0			X					

7.2.2 PAS - Lexington

Parameter	Method	Matrices							
		Air	DW	NPW	SCM	Waste	Tissue		
HPC	Simplate		X						
Total Coliform (P/A)	SM 9223B		X						
Escherichia Coli (P/A)	SM 9223B		X						
Escherichia Coli (MPN)	SM 9223B			X					
Escherichia Coli (MPN)	Colilert-18			X	X				
Fecal Coliforms	SM 9222D			X	X				

7.2.3 PAS - Morgantown

Parameter	Method	Matrices							
		Air	DW	NPW	SCM	Waste	Tissue		
Total Residual Chlorine	Hach 8167			X					
pH	SM 4500-H B			X					
Temperature	SM 2550B			X					
Fecal Coliforms	SM 9222D			X					
Total Coliform (P/A)	SM 9223B		X						
Total Coliform (MPN)	SM 9223B		X						
Escherichia Coli (P/A)	SM 9223B		X						
Escherichia Coli (MPN)	SM 9223B		X						

7.3 Appendix C: Glossary

This glossary provides common terms and definitions used in the laboratory. **It is not intended to be a complete list of all terms and definitions used.** The definitions have been compiled mostly from the TNI Standard and DoD QSM. Although this information has been reproduced with care, errors cannot be entirely excluded. Definitions for the same term also vary between sources. When the meaning of a term used in a laboratory document is different from this glossary or when the glossary does not include the term, the term and definition is included or defined in context in the laboratory document.

Term	Definition
3P Program	PAS-The continuous improvement program used by PAS that focuses on Process, Productivity, and Performance.

Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. DoD- Refers to accreditation in accordance with the DoD ELAP.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program. DoD- Entities recognized in accordance with the DoD-ELAP that are required to operate in accordance with ISO/IEC 17011, *Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies.* The AB must be a signatory, in good standing, to the International Laboratory Accreditation Cooperation (ILAC) mutual recognition arrangement (MRA) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that its accredited laboratories comply with ISO/IEC 17025.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.
Analysis	DoD- A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DoD- The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	DoD- A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
Annual (or Annually)	Defined by PAS as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation). DoD- An all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance conducted on-site.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.

Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.
Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours or the time-frame specified by the regulatory program. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.
Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI and DoD- A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank). DoD- Blank samples are negative control samples, which typically include field blank samples (e.g., trip blank, equipment (rinsate) blank, and temperature blank) and laboratory blank samples (e.g., method blank, reagent blank, instrument blank, calibration blank, and storage blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.
Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	DoD- The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.
Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.

Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100
Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures. DoD- Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	DoD- A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	DoD- The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.
Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)
Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	DoD- Action taken to eliminate a detected non-conformity.
Corrective Action	DoD- The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.
Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.

Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence $(1 - \alpha)$ that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Definitive Data	DoD- Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. DoD- A procedure to establish the ability of the analyst to generate analytical results by a specific method that meet measurement quality objectives (e.g., for precision and bias).
Department of Defense (DoD)	An executive branch department of the federal government of the United States charged with coordinating and supervising all agencies and functions of the government concerned directly with national security.
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.
Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	DoD- SIM specific surrogates as specified for GC/MS SIM analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	DoD- A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.
Documents	DoD- Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	DoD- Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.

Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.
Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.
False Negative	DoD- A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	DoD- A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and sPAS to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.
Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. DoD- An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive, negative, or neutral and is normally accompanied by specific examples of the observed condition. The finding must be linked to a specific requirement (e.g., this standard, ISO requirements, analytical methods, contract specifications, or laboratory management systems requirements).
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).

Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised. For sample prep purposes, hold times are calculated using the time of the start of the preparation procedure. DoD- The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as appropriate.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Improper Actions	DoD- Intentional or unintentional deviations from contract-specified or method-specified analytical practices that have not been authorized by the customer (e.g., DoD or DOE).
Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.
In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	DoD- Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Injection Internal Standard Analyte	Isotopically labeled analogs of analytes of interest (or similar in physiochemical properties to the target analytes but with a distinct response) to be quantitated. Added to all blanks, standards, samples and batch QC after extraction and prior to analysis.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.

Internal Standard	TNI and DoD- A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.
International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	DoD- The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.
Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level. DoD- The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. A LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method at 99% confidence.
Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. DoD- The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.
Linear Dynamic Range	DoD- Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.
Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.

Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement Performance Criteria (MPC)	DoD- Criteria that may be general (such as completion of all tests) or specific (such as QC method acceptance limits) that are used by a project to judge whether a laboratory can perform a specified activity to the defined criteria.
Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.
Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation and test and the operator(s).
Measurement Uncertainty	DoD- An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information. For DoD/DOE, a laboratory's Analytical Uncertainty (such as use of LCS control limits) can be reported as the minimum uncertainty.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.
Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, $1 - \beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by PAS to review large amounts of chromatographic data to monitor for errors or data integrity issues.
Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.

National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.
Operator Aid	DoD- A technical posting (such as poster, operating manual, or notepad) that assists workers in performing routine tasks. All operator aids must be controlled documents (i.e., a part of the laboratory management system).
Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.
Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.

Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.
Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	DoD- Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality System	TNI and DoD- A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.

Quality System Matrix	TNI and DoD- These matrix definitions shall be used for purposes of batch and quality control requirements and may be different from a field of accreditation matrix: • **Air and Emissions**: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device • **Aqueous**: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts. • **Biological Tissue**: Any sample of a biological origin such as fish tissue, shellfish or plant material. Such samples shall be grouped according to origin. • **Chemical Waste**: A product or by-product of an industrial process that results in a matrix not previously defined. • **Drinking Water**: Any aqueous sample that has been designated a potable or potentially potable water source. • **Non-aqueous liquid**: Any organic liquid with <15% settleable solids • **Saline/Estuarine**: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. • **Solids**: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
Quantitation Range	DoD- The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	DoD- Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	DoD- The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).
Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a "standard method", that term is equivalent to "reference method"). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The level at which method, permit, regulatory and customer-specific objectives are met. The reporting limit may never be lower than the Limit of Detection (i.e., statistically determined MDL). Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL. DoD- A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

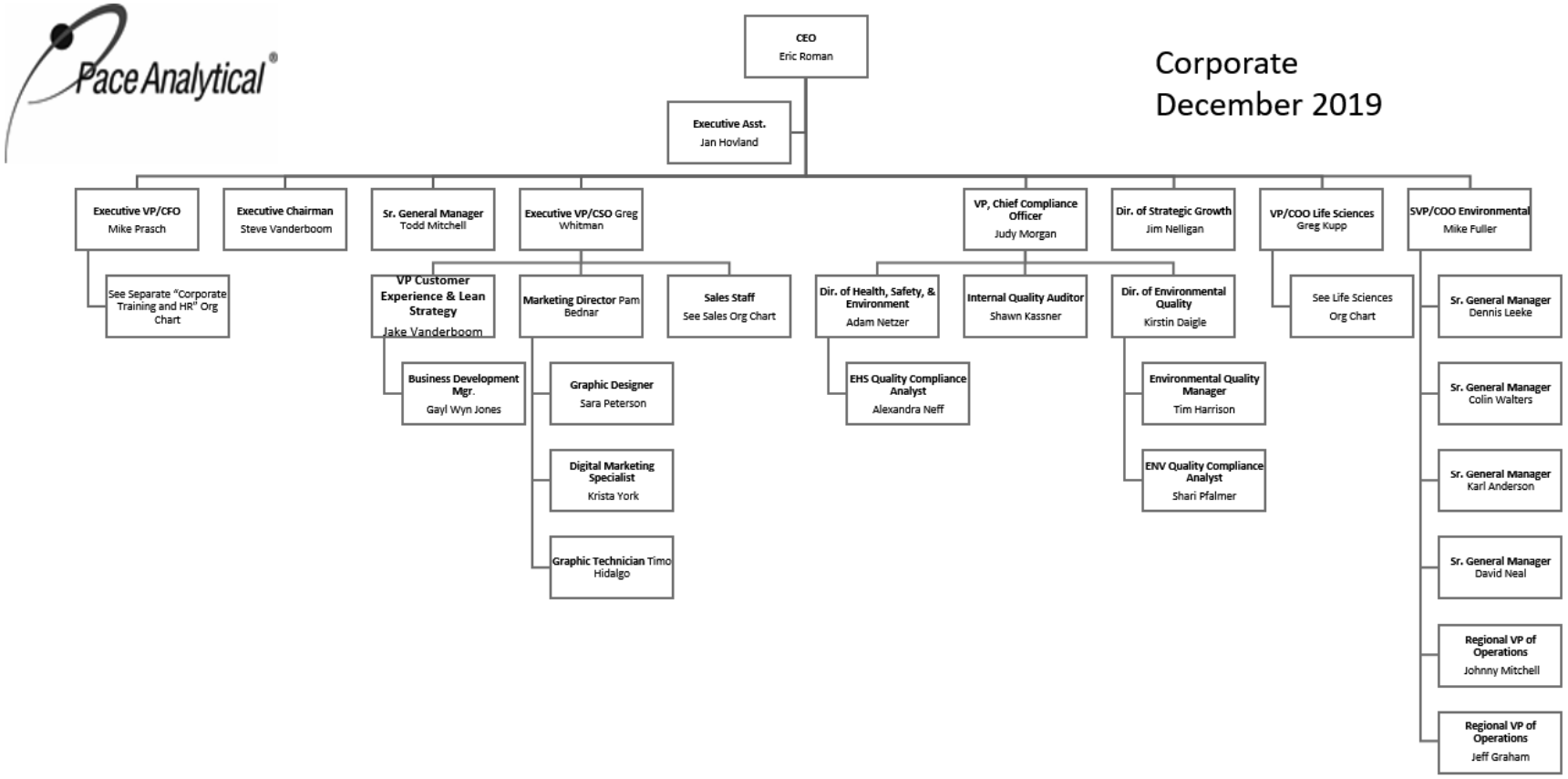
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.
Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.
Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.
Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector. DoD- Using GC/MS, characteristic ions specific to target compounds are detected and used to quantify in applications where the normal full scan mass spectrometry results in excessive noise.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled.
Should	Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.
Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.
Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.

Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	DoD- A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	DoD- A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.
Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	DoD- Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	DoD- A definitive procedure that determines one or more characteristics of a given substance or product.
Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.
The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.

Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).
Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where k > 1).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).
Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	DoD- The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.
Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

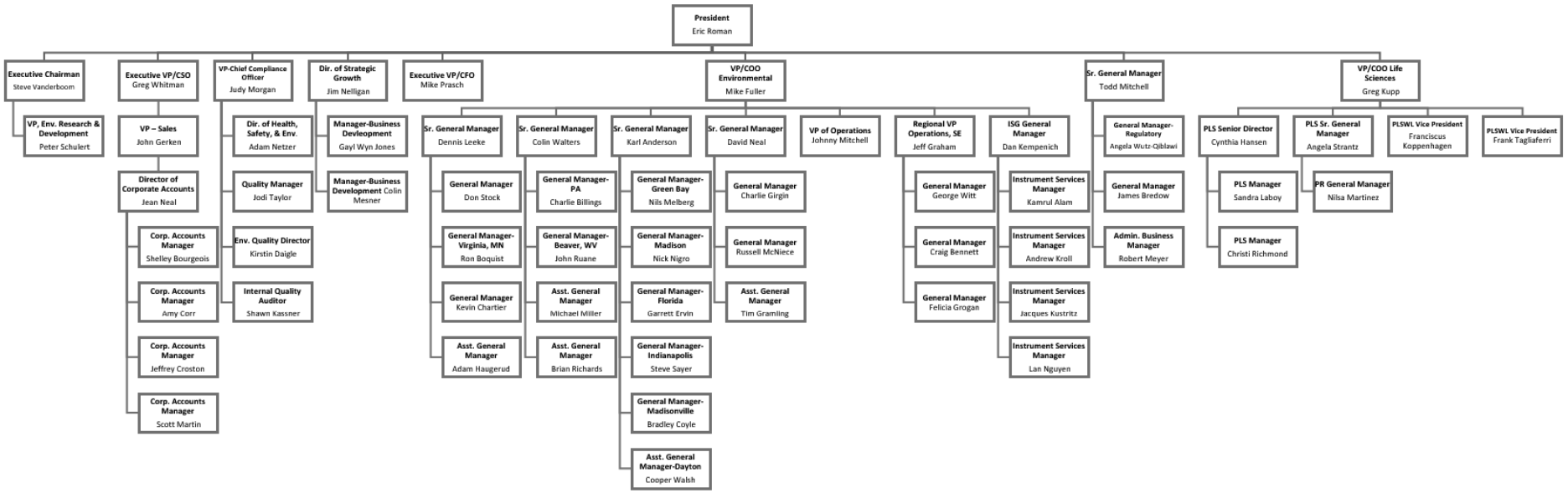
7.4 Appendix D: Organization Chart(s)

7.4.1 PAS - Corporate



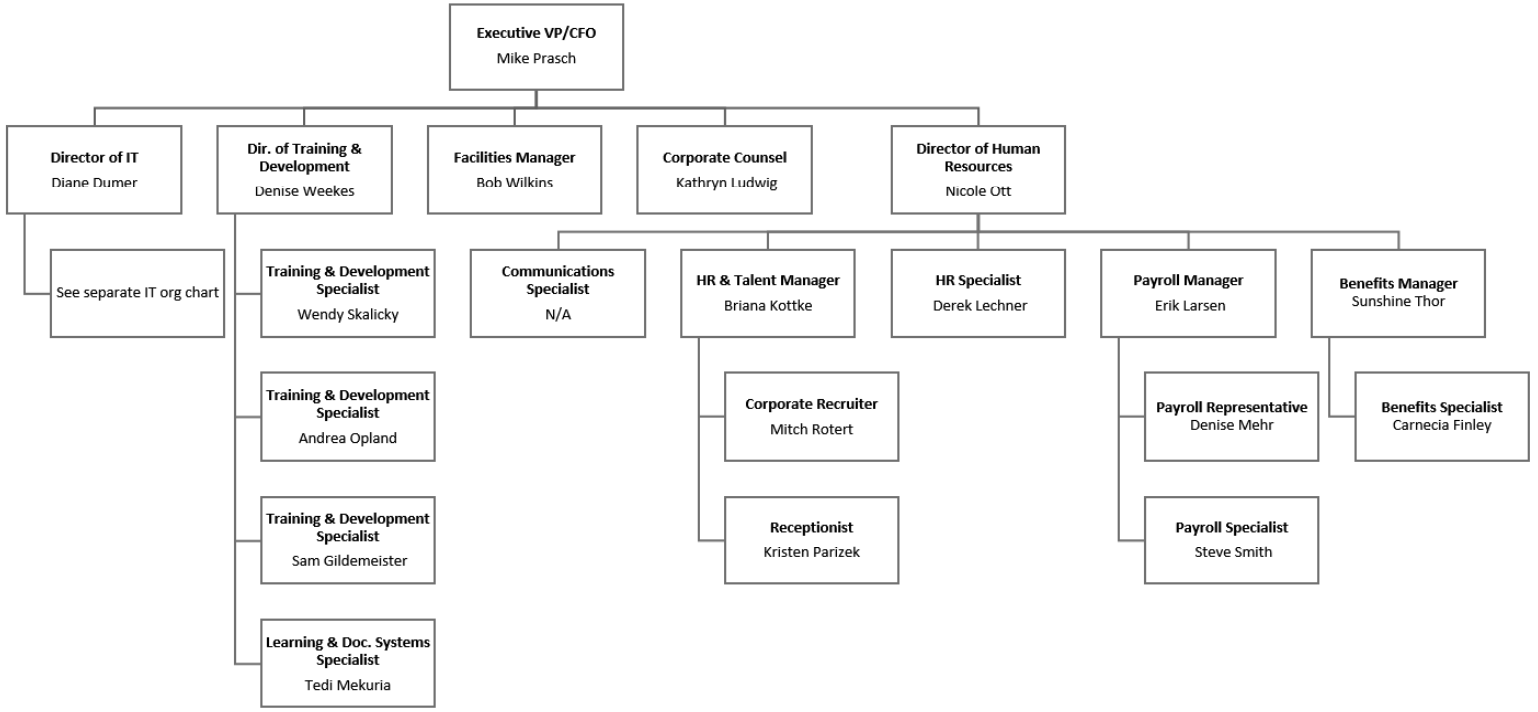
7.4.2 PAS - Corporate

Management Staff
December 2019

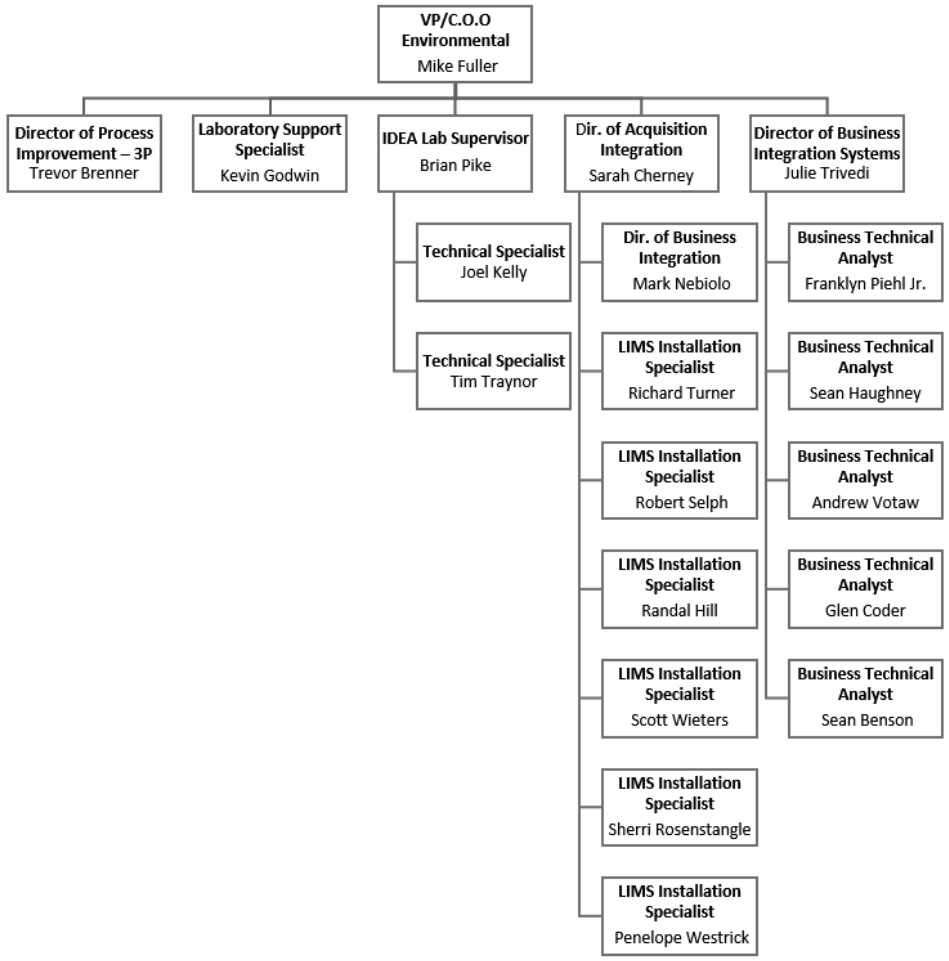


7.4.3 PAS - Corporate

Corporate Staff
Training and HR
December 2019

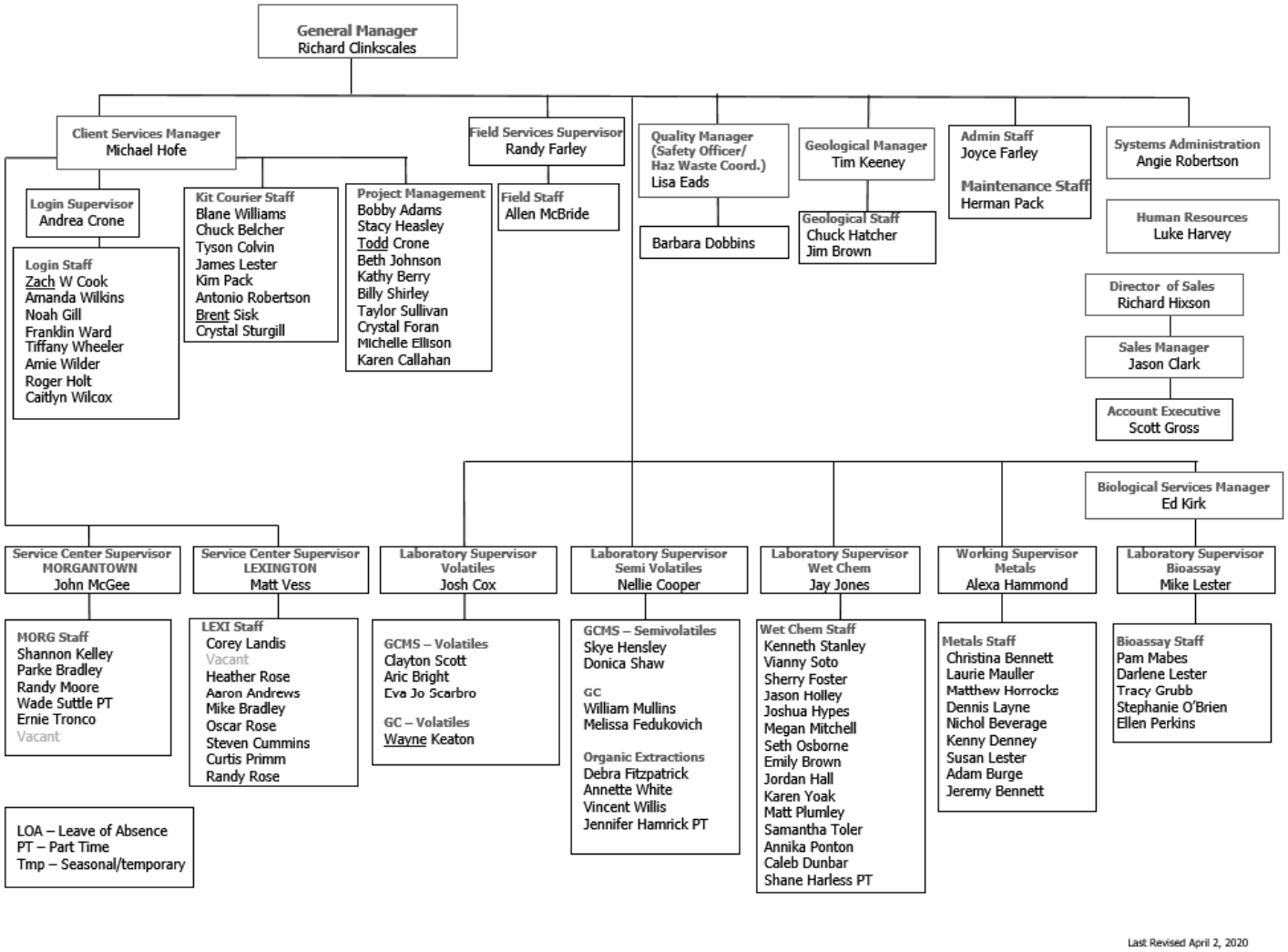


7.4.4 PAS - Corporate



Corporate Staff
ENV Operations
December 2019

7.4.5 PAS - WV (Beaver, Lexington, Morgantown)



7.5 Appendix E: Equipment Listing

The equipment listed represents equipment were held by each location on the effective date of this manual. This information is subject to change without notice. External parties should contact the location for the most current information.

7.5.1 PAS - Beaver

Equipment List: PAS-Beaver

Description	Manufacturer	Model	Serial Number	Service Date	Condition	Location	Internal ID	Manual Location
Analyzer, Discrete	Westco	Smartchem 200	W0902153	2009	Used	Wet Lab	73WA06	Instrument
Analyzer, Flow	Lachat	QuikChem 8500	151000001897	2015	Used	Wet Lab	73WA07	Instrument
Analyzer, HGAF	PS Analytical	Millennium Excalibur	231/4749A12769	2008	Used	Metals	73HG03	Instrument
Analyzer, ICP-MS	Agilent	7700X	JP11431358	2012	Used	Metals	73IM01	Instrument
Analyzer, ICP-MS	Agilent	7900	SG19314540	2019	New	Metals	73IM02	Instrument
Analyzer, ICP-OES	Agilent	5100	MY15260010	2016	Used	Metals	73IP03	Instrument
Analyzer, ICP-OES	Agilent	5110	MY19320005	2019	New	Metals	73IP04	Instrument
Analyzer, Mercury	CETAC	M-7500	041104QTA	2011	Used	Metals	73HG01	Instrument
Analyzer, Mercury	CETAC	M-8000	014402QM8	2014	Used	Metals	73HG02	Instrument
Analyzer, Mercury	Teledyne	Hydra II	112-00101-1/4005	2019	New	Metals	73HG04	Instrument
Analyzer, TOC	Tekmar Dohrmann	Phoenix 8000	US01249002	2001	Used	Wet Lab	73WA05	Instrument
Autosampler, 5100	Agilent	SPS-4	AU15190132	2016	Used	Metals	73IP04	Instrument
Autosampler, 7700	CETAC	ASX-500	US101198A520	2012	Used	Metals	73IM01	Instrument
Autosampler, 7900	Agilent	SPS-4	AU19066325	2019	New	Metals	73IM02	Instrument
Autosampler, Excalibur	PS Analytical	20.4	4749A12769	2008	Used	Metals	73HG03	Instrument
Autosampler, M7500	CETAC	ASX-520	041109A520	2011	Used	Metals	73HG01	Instrument
Autosampler, M8000	CETAC	ASX-520	111310A520	2014	Used	Metals	73HG02	Instrument
Chiller, 5100	Agilent	8481A	1A1560062	2016	Used	Metals	73IP03	Instrument
Chiller, 7700	Agilent	G1879B	2D11A1613	2012	Used	Metals	73IM01	Instrument
GC	Hewlett-Packard	6890+	US00024533	1998	Used	SVOA	73GS1A	Instrument
GC	Hewlett-Packard	6890+	US00024533	1998	Used	SVOA	73GS1B	Instrument
GC	Agilent	6890N	CN10431060	2004	Used	SVOA	73GS2A	Instrument
GC	Agilent	6890N	CN10431060	2004	Used	SVOA	73GS2B	Instrument
GC	Hewlett-Packard	5890 Series II	3223A43710	1990	Used	SVOA	73GS3A	Instrument
GC	Hewlett-Packard	5890 Series II	3223A43710	1990	Used	SVOA	73GS3B	Instrument
GC	Hewlett-Packard	5890 Series II	3019A28629	1990	Used	SVOA	73GS5A	Instrument
GC	Hewlett-Packard	5890 Series II	3019A28629	1990	Used	SVOA	73GS5B	Instrument
GC	Agilent	6890+	US00043338	2005	Used	SVOA	73GS6A	Instrument

GC	Agilent	6890+	US00043338	2005	Used	SVOA	73GS6B	Instrument
GC	Hewlett-Packard	5890 Series II	3133A37645	1996	Used	SVOA	73GS7A	Instrument
GC	Hewlett-Packard	5890 Series II	3133A37645	1996	Used	SVOA	73GS7B	Instrument
GC	Hewlett-Packard	5890 Series II	3308A46965	1992	Used	SVOA	73GS8A	Instrument
GC	Hewlett-Packard	5890 Series II	3308A46965	1992	Used	SVOA	73GS8B	Instrument
GC	Agilent	6890+	US00025299	2011	Used	SVOA	73GS9A	Instrument
GC	Agilent	6890+	US00025299	2011	Used	SVOA	73GS9B	Instrument
GC	Hewlett-Packard	5890 Series II	3303A33205	1991	Used	VOA	73GV03	Instrument
GC	Hewlett-Packard	5890 Series II	32003A41263	1999	Used	VOA	73GV04	Instrument
GC	Hewlett-Packard	5890 Series II	3336A55673	2009	Used	VOA	73GV05	Supervisor Office
GC/MS	Agilent	6890+	US00037590	2003	Used	SVOA	73MS02	Instrument
GC/MS	Agilent	6890+	US00021893	2016	Used	SVOA	73MS03	Instrument
GC/MS	Agilent	7890A	CN10844080	2009	Used	SVOA	73MS04	Instrument
GC/MS	Hewlett-Packard	6890+	US00020797	2017	Used	VOA	73MV01	Supervisor Office
GC/MS	Agilent	6890+	US00038210	2001	Used	VOA	73MV02	Instrument
GC/MS	Agilent	7890A	CN10721037	Unknown	Used	VOA	73MV04	Instrument
GC/MS	Agilent	6890N	CN10403035	Unknown	Used	VOA	73MV05	Instrument
GC/MS	Agilent	7890A	CN10721046	2016	Used	VOA	73MV06	Supervisor Office
IC	Dionex	ICS2000	6060369	2006	Used	Wet Lab	73WA02	Disc
IC	Dionex	ICS2100	10091223	2010	Used	Wet Lab	73WA03	Disc
IC	Dionex	ICS5000	12042016	2012	Used	Wet Lab	73WA04	Disc
Meter, Chlorine	Hanna	H1 96781	H0293621	Unknown	Used	Bioassay	73WT22	Server
Meter, Chlorine	HACH	Pocket Colorimeter II	07080E077089	Unknown	Used	Wet Lab	73WT13	Server
Meter, Conductivity	Hanna	Edge	C0122154	Unknown	Used	Bioassay	73WT23	Server
Meter, Conductivity	Orion	105	1129	Unknown	Used	Bioassay	73WT24	Supervisor Office
Meter, Conductivity	Oakton	CON 510	1582842	2010	Used	Wet Lab	73WT14	Server
Meter, DO	HACH	HQ40d	120700075963	Unknown	Used	Bioassay	73WT25	Server
Meter, DO	HACH	HQ40d	70400008461	Unknown	Used	Wet Lab	73WT09	Server
Meter, DO	HACH	HQ40d	110400054688	Unknown	Used	Wet Lab	73WT10	Server
Meter, DO	HACH	HQ40d	140300101142	2014	Used	Wet Lab	73WT11	Server
Meter, DO	HACH	HQ40d	180200002687	2018	Used	Wet Lab	73WT12	Server
Meter, pH	Oakton	pH 100	12559	Unknown	Used	Bioassay	73WT26	Server
Meter, pH	Oakton	pH700	2709420	Unknown	Used	Bioassay	73WT27	Server
Meter, pH	Orion	520A	10889	Unknown	Used	Metals	73WT16	Server
Meter, pH	Orion	720A	44584	Unknown	Used	Wet Lab	73WT01	Server
Meter, pH	Oakton	pH 150	2489253	2016	Used	Wet Lab	73WT02	Server
Meter, pH	Oakton	pH 11	524243	Unknown	Used	Wet Lab	73WT03	Server

Microwave	CEM	MARS 6	MJ9797	2019	New	SVOA	73MW01	Instrument
Spectrometer	Thermo	Genesys 10S	2L6N176001	2015	Used	Wet Lab	73WT05	Server
Spectrometer	Thermo	Helios Gamma	UVG112025	2003	Used	Wet Lab	73WT08	Instrument
Titrator	Schott	D65719	441895	2002	Used	Wet Lab	73WA08	Supervisor Office
Titrator	Schott	D65720	441894	2002	Used	Wet Lab	73WA09	Supervisor Office
Titrator	Schott	D65719	445628	2011	Used	Wet Lab	73WA10	Supervisor Office
Turbidimeter	HACH	2100AN	990800002052	Unknown	Used	Wet Lab	73WT55	Server

Appendix D
Health and Safety Plan

Instructions: *The author should review and complete this Health and Safety Plan (HASP). All text in RED, checklists, and forms should be completed. The preparer may delete sections that are not applicable to the proposed work. Contact your Office Safety, Health, and Environment (SH&E) Representative (SHER) or Area/Regional/Business Line SH&E Manager (SHEM) for assistance and for review and approval upon completion. Note: This document contains hyperlinks that require connection to the AECOM network and access to Ecosystem.*

Project Health and Safety Plan (DCSA)

During Coronavirus Pandemic

Cheat River Rail-Trail Corridor

Cheat River

Preston County, West Virginia

Click here to enter SITE CITY, STATE/PROVINCE, ZIPCODE/POSTAL CODE

Expiration Date: **May 5, 2021**
*(*Valid for one (1) year maximum or until the scope of work, methods and/or equipment change*)*

Prepared for: Friends of the Cheat
1343 North Preston Highway
Kingwood, WV 26537

Prepared by: AECOM
150 Clay Street, Suite 410
Morgantown, WV 26501

Prepared By:	*Name*	Lee Shields	Signature:	
	Title	Office SH&E Rep	Date:	05/08/2020
Reviewer: Area/Regional/ Business Line/Client SHEM:	*Name*	Alberto Munuera	Signature:	
	Title	Southeast SH&E Manager	Date:	05/06/2020
Approval: Project/Program Manager:	*Name*	Chris Channell	Signature:	
	Title	Project Manager	Date:	

HASP Summary

Note: This Summary is intended to provide key information only and cannot be substituted for reading, understanding, and complying with the full HASP, including the Emergency response section. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary

Project Name:	Cheat River Rail-Trail Corridor, BAJ 3.0 to BAJ 11.7, Manheim to Caddell	**Project Number:**	60589127
		Client Name:	Friends of the Cheat

Report ALL SH&E Incidents, no matter how minor, to the Incident Hotline: 800-348-5046
Injury, Property Damage, Vehicle, Security, Regulatory Inspection, Environmental Impact, and any potentially work related injury, discomfort/ pain, or damage.

Identify the nearest Occupational Clinic and Hospital to the site that accepts AECOM Workers Compensation Insurance (see **Attachment A** for instructions). If the nearest such clinic or hospital is an unreasonable distance from the site, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in **Attachment A**.

Occupational Clinic:		**Nearest Hospital:**	Mon Health Preston Memorial Hospital
Address:		**Address:**	150 Memorial Drive, Kingwood, WV
Phone Number:		**Phone Number:**	304 – 329 - 1400

Key Personnel

Project Manager (PM):	Chris Channell	**Cell Phone:**	304-290-8127
Site Supervisor (SS)	Varies	**Cell Phone**	
Safety Officer (SSO):	Varies	**Cell Phone**	
AECOM SH&E Mgr.	Alberto Munuera	**Cell Phone:**	
Client PM:	Amanda Pitzer	**Cell Phone:**	

List ALL Short Service Employees and subcontractors (<6 Months with Company in Current Job Description):

List ALL Subcontractors (including 2nd and 3rd tier) and their Site Safety Officers:
Downstream Strategies, Marc Glass

PM must verify all 1st tier subcontractors are approved in Subport (and that 2nd and 3rd tier are prequalified by the 1st tier subcontractor) for the work described. An equivalent evaluation process of 2nd and 3rd tier subcontractor prequalification by the 1st tier subcontractor should be verified by the PM including:

- Copy of their Corporate Safety Management Manual
- Copy of their Project/Site-specific health and safety plan
- Copy of task specific THAs/JHAs and daily inspection/tailgate forms
- Copy of their Pre-Qualification form
- Copy of their latest Workers Compensation Board (WCB) documents Copy of the signed contract
- Copy of their signed contract
- Copy of their business license and training certificates (task specific)

If there were any limitations/ conditions of approval, describe them below and how they are being met:

☑ I have verified that all subcontractors are approved in Subport (or equivalent), and that all conditions of approval are met.

Project Manager Name	Project Manager Signature	Date

Table of Contents

Attachments

Attachment A: Hospital/Clinic Maps and Incident Reporting Flow Chart
Attachment B: THA Forms, and Tailgate Safety Meeting Form
Attachment C. AECOM SHE Procedures
Attachment D. Stretch/Flex Poster
Attachment E: Site Orientation
Attachment F. Safety Data Sheets
Attachment G Work Plan/Client SH&E Requirements (Delete if not applicable)

Revision Log

Version	Issued / Revised By	Date	Details of Revisions
Template Revisions			
1.0	Alberto Munuera, Patrick Walz, & Gregg Ferris	February 14, 2020	Initial Version, merging and replacing previous template documents (Hazwoper HASP and Industrial/Project HASP)
1.1	Patrick Walz & Alberto Munuera	March 26, 2020	Modified to add Coronavirus prevention and response guidelines
Project-Specific Revisions			

1. Introduction

This written HASP is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for AECOM-managed activities. This HASP must be kept on site during work activities and made available to all workers including subcontractors and other site occupants for informational purposes. AECOM subcontractors are expected to independently characterize, assess, and control site hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See **Attachment B** for the Project Task Hazard Assessment forms and **Attachment C** for complete copies of applicable field SH&E Procedures.

Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents (Add or delete as applicable):

- Federal Occupational Safety and Health Administration (OSHA) Code of Federal Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction.
- Title 8 of the California Code of Regulations (8 CCR), with special attention to Section 5192 Hazardous Waste Operations and Emergency Response, and Section 3202, Injury Illness Prevention Program and to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health and Environment (SH&E) Manual.

2. Site Description

The Cheat River Rail-Trail Corridor, BAJ 3.0 to BAJ 11.7, Manheim to Caddell site is located in Kingwood, West Virginia. The site is a former CSX rail line that is being converted into a rail-trail. There are seven bridges that carry the trail over rivers and streams.

2.1 Site Background/History

The site has been walked several times and numerous photo's are available. There has been a soil study to determine any hazards that are in the soil.

2.2 Client or Third-Party Operations at Site

There will be multiple work operations going on during the life of the project. These include structural improvements to bridges, soil remediation, test drilling, etc.

2.3 Scope of Work

2.3.1 Project Scope and Objective(s)

AECOM will provide soil sampling, analysis, development of a remediation plan and rail trail design and environmental sampling along the entire trail..

Downstream Strategies will provide environmental engineering consultation.

Pace Lab will provide soil testing analysis.

Enviroprobe Drilling will provide on site drilling.

CEC or Potesta will provide geotechnical engineering review.

2.3.2 Risk Register

The following tasks will be performed to achieve the project objective(s). A Task Hazard Assessment (THA) for each operation being performed by AECOM must be included in Appendix B, while those performed by the managed subcontractors should be prepared by the subcontractor. Oversight of managed subcontractor activities is considered a discrete AECOM task, and should be listed below.

Task Name	Permit(s) Required		Task Performed By		
			AECOM	SUB	Third-Party
Coronavirus Precautions THA	☐ Yes	☒ No	☒	☐	☐
Slips, Trips, and Falls	☐ Yes	☒ No	☒	☐	☒
Wildlife, Plants, and Insects	☐ Yes	☒ No	☒	☐	☒
Weather Condition Hazards	☐ Yes	☒ No	☒	☐	☐
All- Terrain Vehicle Operation	☐ Yes	☒ No	☒	☐	☐

Lifting and Transporting Items	☐ Yes	☒ No	☒	☐	☐

2.3.3 Scope of Work Risk Assessment

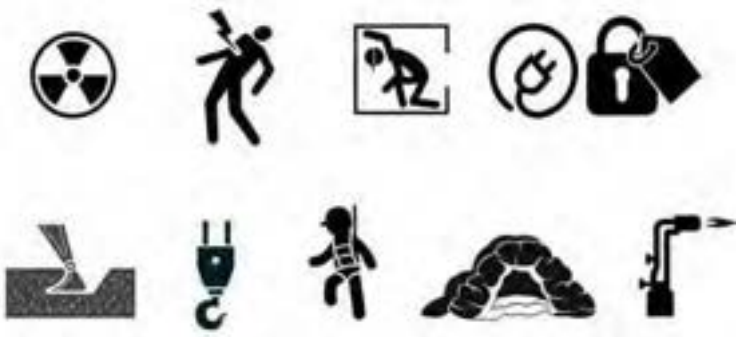
☒	Low Risk	Examples: Non-intrusive work, occasional exposure and/or low risk hazards
☐	Medium Risk	Examples: Intrusive work, heavy equipment use, frequent exposure and/or moderate hazards
☐	High Risk	Examples: Complicated scope, large/multiple work crews, and/or constant exposure to hazards

In general, the following tasks are considered High Potential (HiPo) tasks (also identified in S3AM-209-PR, Risk Assessment). Depending upon the factors contributing to the severity and probability assessment of a hazard associated with a particular task, other HiPo tasks or activities could be added to the list below. The following HiPo tasks will be required to complete the approved scope of work

☐	Working at heights	☐	Working in avalanche areas
☐	Working in a confined space	☐	Working on water or ice
☐	Working in a trench	☐	Working in remote or wilderness isolation
☐	Lock out/tag out (energy isolation) tasks	☐	Working in a controlled area
☐	Work on energized equipment	☐	Extreme heat or cold stress environments
☐	Working with electricity	☐	Working with power tools/equipment
☐	Working with hazardous substances or materials	☐	Working with/operating heavy equipment/machinery
☐	Working with material under pressure	☐	Working around mobile equipment
☐	Working where there is a possible threat of violence, including civil unrest	☐	Working in isolation from first aid services or immediate/emergency assistance
☐	Asbestos removal/contact	☐	Highway and road work
☐	Other HiPo Task(s) [specify]: ▪ [List] ▪ [List]		

The following AECOM procedures provide task specific permit requirements and shall be consulted if applicable to the scope of work (*S3AM-218-PR*):

☐	S3AM-120-PR, Radiation
☐	S3AM-209-PR, Risk Assessment & Management
☐	S3AM-301-PR, Confined Spaces
☐	S3AM-302-PR, Electrical Safety
☐	S3AM-303-PR, Excavation
☐	S3AM-304-PR, Fall Protection
☐	S3AM-310-PR, Cranes & Lifting Devices
☐	S3AM-325-PR, Lockout Tagout
☐	S3AM-330-PR, Underground Work
☐	S3AM-332-PR, Hot Work



2.4 Site Housekeeping and Personal Hygiene

Basic housekeeping requirements for offices and work sites, as well as personal hygiene and sanitation standards can be found in S3AM-013-PR Housekeeping. Inspections should be performed at the regular interval specified below. The housekeeping inspection form S3AM-013-FM1 is available for use. Complete the table below regarding site-specific Housekeeping and Personal Hygiene requirements:

Housekeeping:	Inspection Frequency:	
	Inspector:	
Eating, Drinking, Smoking:	Permitted only in designated area(s).	
Handwashing:	Water, soap and paper towels or equivalent supplies are not available at the site. It is suggested to bring your own hand washing supplies. Site staff will wash hands and face after completing work activities and prior to breaks or meals.	
Toilets:	**Toilets** are not available at the site location. *NOTE: A minimum of one toilet must be provided for every 20 personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.*	
Water:	**Water** is not available at the site. A water supply meeting the following requirements will be utilized: *Potable Water:* An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Disposable drinking cups for single use and a waste receptacle will be provided as needed. Water containers will be refilled daily and disinfected regularly. Potable water containers will be properly identified in order to distinguish them from non-potable water sources. *Non-Potable Water:* Outlets for non-potable water shall be posted or otherwise marked in a manner that will indicate clearly that the water is unsafe and is not to be used for drinking, washing of the person, cooking, washing of food, washing of cooking or eating utensils, washing of food preparation or processing premises, or personal service rooms, or for washing clothes. **Non-potable water is water that does not meet OSHA's Sanitation standard for potable water.** All containers of non-potable water will be marked with a label stating ***"Non-Potable Water, Not Intended for Drinking Water Consumption"***	
Illumination:	**Illumination** will not be needed. All work will be conducted during daylight hours. If natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area.	

3. AECOM Safety Health and Environment Program

3.1 AECOM Policy

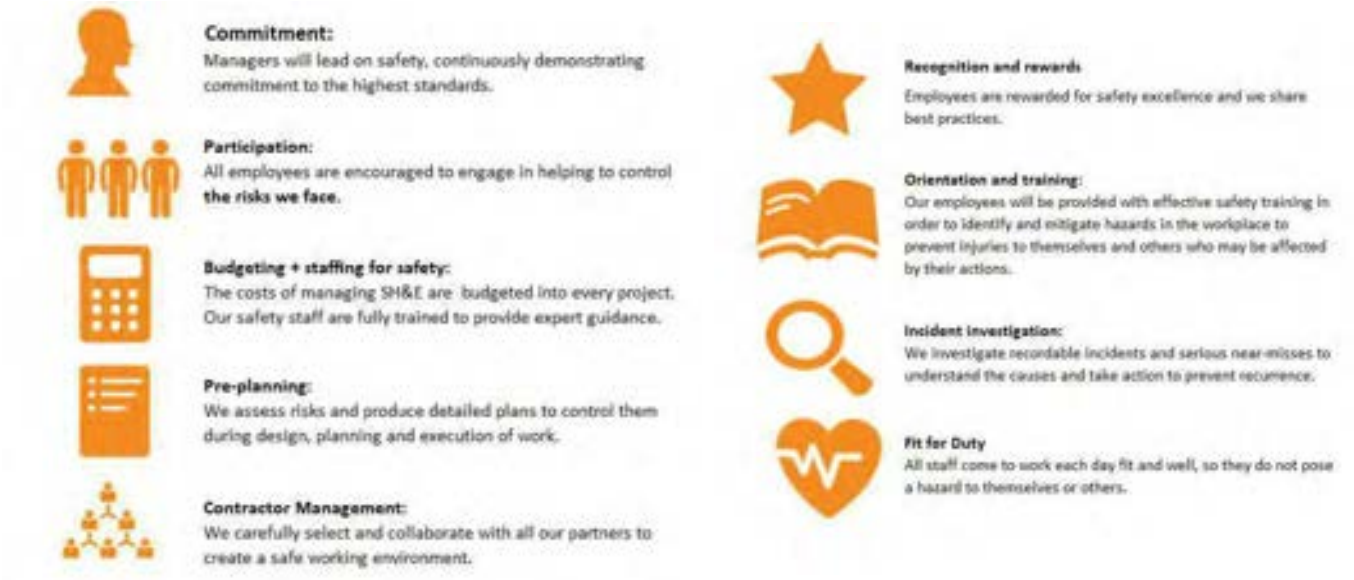
AECOM's Safety, Health and Environment Policy, which establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance in the interest of benefitting AECOM's employees and stakeholder in the global marketplace, is available on AECOM's Ecosystem (intranet).

3.2 Safety For Life

"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our nearly 100,000 employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.

3.3 Life Preserving Principles

AECOM has adopted these "Life-Preserving Principles" to help demonstrate the commitment of our Safety for Life program. We firmly believe these "Life-Preserving Principles" will enable AECOM to achieve its goal of zero employee injuries, property damage and an environmentally friendly and sustainable workplace. The nine Life-Preserving Principles, along with their descriptions, can be found on AECOM's Ecosystem (intranet).



3.4 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure S3AM-005-PR, which includes the following key practices:

1. **Authorized Drivers**
   Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.

2. **Electronic Devices Prohibited**
   AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment which includes being stopped at a traffic light or stop sign. This includes cell phones, two-way radios and other items whether hand-held or hands-free. Electronic devices include, but are not limited to, all mobile phones, pagers, iPods, MP3s, GPS, DVD players, tablets laptops and other portable electronic devices that can cause driver distraction. Hands-free device use is not allowed.

   - GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall not be changed by the driver while driving.

3. **Vehicle Inspections**
   The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, S3AM-005_FM2, can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.

4. **Training**
   All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure S3AM-005-PR and SHE Training procedure S3AM-003-PR for more details.

5. **Journey Management Plan**
   Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using S3AM-005-FM1 or equivalent.

6. **Secure Loads**
   Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.

7. **Backing Up**
   Reversing the vehicle is to be avoided if at all possible. If backing up is necessary, use the following guidelines:

   ✓ Pre-plan all vehicle movements.

- ✓ If the pull-through method of parking is not possible, drivers will scan parking spot/area for hazards and back in; thereby, facilitating departure where the first move is forward.
- ✓ A light tap of the horn should be used to alert others of your intention to back up.
- ✓ Avoid tight spaces.
- ✓ Vehicles rated over 10,001 pounds (4,536 kilograms) gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training. (For additional requirements pertaining to vehicles in this weight rating, see Commercial Motor Vehicles procedure S3AM-320-PR).
- ✓ All vehicles shall have a competent spotter in place when backing in an active work zone. Parking and public access areas are recommended but not required to have a spotter.

3.5 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure S3AM-008-PR). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should ensure they are fit for duty prior to leaving home and unimpaired by substances or fatigue, and if necessary, contact your supervisor rather than attempting to report to work in unfit condition. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will not tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

3.5.1 Medical Surveillance

3.5.2 Proactive Health

AECOM is committed to promoting proactive health activities in addition to the planning for prevention of safety and environmental incidents. Proactive health activities will be completed on an on-going basis at AECOM on a corporate-wide basis (i.e. Wellness program associated with employee benefits), at offices, and at this project site. Management will be actively involved in providing and encouraging opportunities for health and wellness education and improvement. Health initiatives and education will be discussed periodically during office-based meetings as the safety moment or during the daily tailgate meeting as a toolbox talk. Topics may be related to, but are not limited to:

- ✓ Heart health;
- ✓ Stress management;
- ✓ Smoking cessation;
- ✓ Diabetes prevention;
- ✓ Diet; and
- ✓ Exercise benefits.

Topics and educational materials can be located on the AECOM Wellness page, National Institutes of Health website, Centers for Disease Control and Prevention website and other reputable sources online.

In addition, the field team will be encouraged to participate in a daily stretch and flex routine (a standardized way to avoid soft tissue damage from work activities) to the best of their abilities, given their own personal limits. It is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The Stretch and Flex manual and poster (Attachment D) serve as guidance for the leader to follow.

3.5.3 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or requires additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure S3AM-009-PR).

3.5.4 Fatigue and Driving Safety

The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.

- ✓ After strenuous fieldwork, consider overnight accommodation or vehicle sharing for staff who are not acclimatized to the type of work.
- ✓ Microsleep can occur with a limited warning, and may be linked to several factors, for example:
  - o Microsleep is most likely to occur during times when the circadian rhythm dictates the body should be asleep, such as at dawn, late at night, or in the mid-afternoon (e.g. 1 and 4 am and 1 and 4 pm.).
  - o Potential to feel drowsy after a meal.
  - o Driving long distances (considered potentially monotonous), even with sufficient sleep.
  - o Prolonged sitting and warm ambient temperature may also increase the feeling of sleepiness.
- ✓ If safe to do so, consider undertaking actions to disrupt the microsleep event while identifying a safe place to stop, e.g., open a vehicle window, listen to upbeat music/change music source or ask the passenger (if present) to engage in conversation.
- ✓ Ensure field staff are familiar with the signs of fatigue and mitigation factors.

The most common visible signs of microsleep include:

- ✓ Eyelid drooping
- ✓ Eyelid closure
- ✓ Head nodding
- ✓ Brief periods of snoring
- ✓ Wandering thoughts

If any of the above become apparent, immediately pull over to a safe location and contact your PM or SH&E representative.

3.5.5 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure (S3AM-019-PR) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood or mind altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution and possession of marijuana are violations of federal law and AECOM policy, and will subject an employee to disciplinary action up to and including termination in accordance with controlling law. In Canada, where medical and recreational marijuana use is legal, employees must still follow Federal and Provincial laws, and AECOM policy with regards to use and possession.

Employees found to be in contravention of legal requirements or AECOM policy will be subject to disciplinary action up to and including termination.

3.6 Rewards and Recognition

One of AECOM's Life Preserving Principles is Recognition and Rewards for proactive safety, health and environmentally focused behaviors. All projects are expected to participate in the rewards and recognition programs available on the Corporate and DCS Americas SH&E ecosystem pages. Large, long term projects are encouraged to establish a project specific rewards and recognition program which incorporates project specific goals and activities (template available S3AM-020-FM1). ***All rewards and recognition programs must emphasize the 9 Life Preserving Principles and proactive SH&E activities NOT solely the achievement of lagging metrics ("injury/incident-free" hours, etc.) as those may discourage incident reporting.***

There are several possible appropriate methods of rewarding and recognizing employees and contractors:

1. **Informal** – recognition via verbal acknowledgment, email, spot awards, luncheons, etc.
2. **Formal** -

DCS Americas Programs

1. AECOM Safety Star Recognition Program
2. AECOM Making a Difference Award
3. Executive Challenge Coins

Program Details Available on Ecosystem

3.7 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure S3AM-317-PR describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work site. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment (S3AM-317-FM1) to help determine the appropriate glove for the hazard(s).
- **Fixed open-blade knives are prohibited** from use during the course of AECOM work. Examples of fixed open-blade knives include pocket knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see S3AM-317-ATT1 Safe Alternative Tools.

3.8 Safety Observations

Safety observations are observations made by employees or subcontractors of a condition or behavior which could contribute to an incident, prior to the incident occurring. Observations can also identify positive behaviors or interventions which contribute to the prevention of incidents. Large, long-term projects may benefit from the use of LifeGuard to track and trend observations on a site level. All other projects should log their observations using IndustrySafe. Both reporting systems can be accessed on any safety page of Ecosystem. Or the QR codes below can be used while off the AECOM network from a smartphone/ device.

3.9 Newly Hired or Transferred Employees

All newly hired or transferred employees with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications are considered “Short Service Employees”, or “SSEs” (see the Newly Hired or Transferred Employees procedure, S3AM-015-PR). The Project Manager will identify all SSEs working on the project, and each SSE will be assigned to an experienced team member so all activities may be monitored. All SSEs working or visiting a field environment are required to wear a green hard hat for safety and identification purposes. In the event a client has an existing SSEs program, AECOM will defer to the identification system required by the client. Any new employee shall wear the designated SSE identifier until the Project Manager determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

The project scope of work does not currently involve SSEs. If it becomes necessary to use one or more SSEs to complete the project scope of work, they will be evaluated and approved in advance by the AECOM Project Manager prior to mobilizing to site, and listed in this HASP.

The project scope of work does involve the use of one or more SSEs. The SSEs have been approved to perform field activities by the Chris Channell and are listed in the SSE log below.

Short Service Employees Log

Name of **SSE**	Mentor’s Name	Mentor’s Contact No.

3.10 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure S3AM-002-PR) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a site controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation. Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or site engineer, or if necessary, the client or party managing the contractor.

No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.

4. Roles and Responsibilities

Roles and responsibilities for the project team are defined below. The Project Manager (PM) is ultimately responsible for the development of this HASP and establishing a budget to implement the controls and training required. The Project Manager is also responsible for ensuring that the plan is implemented, that appropriate documentation is generated, and that records are maintained. The SH&E Manager is responsible for reviewing and approving this HASP and assisting with other SH&E matters upon request. A Site Safety Officer may be appointed to oversee implementation of the HASP in the field. All project team members are responsible for reviewing and abiding by this HASP, performing daily (or more frequent) task hazard assessments, stopping work when necessary to correct unsafe behaviors or conditions, and reporting incidents promptly to the PM and AECOM Incident Reporting Hotline

DCS Americas Incident Hotline: 1-800-348-5046

4.1 Project Manager[Chris Channell]

The Project Manager has overall management authority and responsibility for all site operations, including safety. The Project Manager will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations. Some of the Project Manager's specific responsibilities include:

- Project start-up activities require appropriate SH&E planning prior to work commencing, including identification of hazards, associated risk, and appropriate controls for each task and operation found in the work scope.
- Completed project risk registers /task hazard assessments shall be incorporated into the Project's HASP.
- Verifying that personnel, to whom this HASP applies, including AECOM subcontractors, have received a copy of it, with ample opportunity to review the document and to ask questions.
- Providing the concurring SH&E Manager with updated information regarding conditions at the site and the scope of site work if changes occur that will affect the accuracy of this HASP.
- Providing adequate authority and resources to the Site Supervisor or Site Safety Officer to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the Site Supervisor or Site Safety Officer and, when necessary, the AECOM Client SH&E Program Manager.
- Coordinating the activities of AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for these projects, when applicable.
- Conducting Safety System Auditing by way of Management Site Visits and/or Project Manager Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the Site Supervisor or Site Safety Officer).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.2 Site Supervisor [Varies]

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The Project Manager may act as the Site Supervisor while on site. The Site Supervisor's responsibilities include:

- Discussing deviations or drift from the work plan with the Site Safety Officer and Project Manager.
- Discussing safety issues with the Project Manager, Site Safety Officer, and field personnel.

- Assisting the Site Safety Officer with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the Site Safety Officer with the implementation of this HASP and ensuring compliance.
- Assisting the Site Safety Officer with inspections of the site for compliance with this HASP and applicable SH&E Procedures.
- Reviewing Project Risk Register/ Task Hazard Assessments and Task Hazard Assessments (THAs) with the work crew.
- Reporting incidents and ensuring incidents and observations are logged into Lifeguard or IndustrySafe.
- Verifying that all operations follow the requirements of this HASP and halting any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the Site Safety Officer, the SH&E Manager, and the Project Manager.

4.3 Site Safety Officer [Varies]

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Updating the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the SH&E Manager.
- Inspecting the site for compliance with this HASP and the SH&E Procedures using the appropriate field audit inspection checklist found in IndustrySafe.
- Coordinating with Site Supervisor to review THAs with the work crew.
- Assisting as needed to report incidents and verify that incidents and observations are logged into Lifeguard or IndustrySafe.
- Working with the Site Supervisor and Project Manager to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contacting the SH&E Manager for technical advice regarding safety issues.
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Checking that all site personnel and visitors have received the proper training, orientation and medical clearance prior to entering the site.
- Establishing controlled work areas (as designated in this HASP or other safety documentation).
- Facilitating or co-leading daily tailgate meetings and maintaining attendance logs and records.
- Discussing potential SH&E hazards with the Site Supervisor, the SH&E Manager and the Project Manager.
- Selecting an alternate Site Safety Officer by name and informing him/her of their duties, in the event that the Site Safety Officer must leave or is absent from the site.
- Verifying that all operations follow the requirements of this HASP.
- Issuing a "Stop Work Order" under the conditions set forth in this HASP.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the SH&E Manager and the Project Manager.

4.4 Employees[Varies]

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the SH&E Procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to SH&E management for continuous improvement relating to omissions and modifications in the HASP or other safety policies and procedures.
- Notifying the Site Supervisor or Site Safety Officer of unsafe conditions and acts.
- Stopping work if there is doubt about how to safely perform a task or if unsafe acts or conditions are observed (including subcontractors or team contractors).
- Speaking up and refusing to work on any site or operation where the SH&E procedures specified in this HASP or other safety policies are not being followed.
- Contacting the Site Supervisor or Site Safety Officer or the SH&E Manager at any time to discuss potential concerns and update the THA in the field to reflect the modifications. Provide THA feedback to the supervisor for continuous improvement
- Calling the AECOM Hotline if an SH&E incident happens (+1-800-348-5046)
- Provide THA feedback to the supervisor for continuous improvement.

4.5 Subcontractors [Varies]

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in AECOM Procedure S3AM-213-PR Subcontractor Management. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE) and all required training.

Each subcontractor that will be contracting any portion of their scope of work is required to obtain authorization to use those subcontractors that were not directly hired by AECOM prior to their mobilization to site. In addition, AECOM direct subcontractor is required to communicate both AECOM and client requirements and expectations to their subcontractors. The AECOM PM is required to confirm that all subcontractors used on the project meet both AECOM and client Safety, Health and Environment (SH&E) Evaluation Criteria, requirements and expectations. This includes confirming that individuals are competent to perform their assigned tasks and duties, obtaining authorization to use one or more short-service employees, and confirming that verification of competency can be provided upon request. In addition, the Project Manager must approve the use of all subcontractors (no matter the level) prior to their mobilization to site.

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services as well as all other requirements applicable to their work. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures applicable to work that is exclusive to their activities on the site, and for which they may have superior knowledge. All subcontractor procedures must at a minimum comply with client and AECOM requirements in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior mobilization to the site.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the AECOM Project Manager or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

4.6 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, the visitor will be denied access to the EZ. If the visitor disregards instructions to remain outside the EZ, work activities will be immediately suspended, and the situation reported and documented.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas. If unauthorized visitors and/or visitors not meeting the specified qualifications enter a controlled work area and/or EZ, work activities will be immediately suspended, and the situation reported and documented.

5. Training and Documentation

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and Procedures.

5.1 HASP/SITE Orientation

The Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment E**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

5.2 Daily Tailgate Meetings and THA Review

The Site Supervisor, Site Safety Officer or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP and review the applicable THAs prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site contracted to AECOM. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The supervisor will then convey the information to the work crew. The Tailgate Meeting must be documented by the Site Supervisor or Site Safety Officer on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment B**.

As part of the daily tailgate meeting, employees and subcontractors will be encouraged to voluntarily warm up and stretch select muscle groups to the best of their ability and within each person's individual limitations. Stretching is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The exercises included in Attachment D may be used to facilitate these efforts.

5.3 Worker Training and Qualifications

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure S3AM-003-PR establishes the general training requirements for AECOM employees.

Check all required training on the table below. Verify training records of employees and subcontractors.

Site Specific Training Requirements

Training		Applies to
☒	ERP/HASP and Site Orientation	All Employees and Subcontractors
☒	Vehicle/Driver Safety & Defensive Driving	All Employees who drive on behalf of AECOM
☒	Field Safety	Employees visiting the field that does not require HAZWOPER
☒	Speak Up/Listen Up (SULU)	All AECOM field employees and supervisors
☐	First Aid / CPR	Designated employees or employees performing high risk activities and medical attention is more than 4 minutes away
☐	Respiratory Protection & Fit Test	Employees needing to wear respirators
☒	OSHA 10-Hr. Construction Safety (or CSTS 2020 in Canada)	Refer to Section 5.3.1 for guidance

☐	OSHA 30-Hr. Construction Safety	Refer to Section 5.3.1 for guidance
☐	HAZWOPER 40-Hour and 8-Hr. Annual Refresher	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☐	HAZWOPER Supervisor	Employees managing others in HAZWOPER activities or at HAZWOPER Sites
☐	Hazardous Materials Shipping (U.S.)	Employee responsible for shipping HZM/HZW/DG and/or signing manifests
☐	Transportation of Dangerous Goods (CAN)	Employees responsible for shipping/transporting regulated hazardous materials that exceed regulatory requirements
☐	Annual Medical Surveillance / Clearance	Employees working in an exclusion zone and the regulatory required exposure limit is exceeded for 30 or more days a year
☐	Biennial Medical Surveillance / Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is not exceeded
☐	Under Bridge Inspection Unit (UBIU) AECOM University module	Employees working in a UBIU
☒	All-Hands Coronavirus Training:	All Employees
☐	Local and/or Client Requirements:	

5.3.1 OSHA 10 Hr. (or CSTS 2020)/OSHA 30 Hr. Training

OSHA 10 (or CSTS 2020 in Canada) and OSHA 30 training is required for projects with construction, demolition or construction/industrial-like hazard, including work where we, our client, or another contractor are presently building, removing, or disassembling structures or digging excavations of any size by mechanical means, or using heavy machinery, doing work at heights, confined space, hot work, lifting/hoisting loads, or working with LOTO procedures, or ground breaking.

“Construction//industrial-like hazards” occur on sites where the focus is NOT construction/industrial activities, but where our work scope includes use of heavy machinery movement, work at heights, confined space, hot work, lifting/hoisting loads, LOTO activities, and/or ground breaking (includes drill rig, direct push and vac truck use).

OSHA 10 (or CSTS in Canada) is needed if this type of work is being performed within our work area or if it may impact our work area. It is not applicable if our work area is separated from the construction/demolition/industrial area with enough distance or physical barriers that fully prevent exposure of our team to those hazards. This includes projects where we serve as Inspectors, or any work where our employees are exposed to construction/industrial site hazards.

OSHA 30 hr. training is required for supervisors in the United States. The term “supervisor” has many different meanings. The requirement to complete the OSHA 30 hr. course will be based on field supervisory roles and responsibilities, not administrative supervision roles. Field supervisors required to take the OSHA 30 course are defined as those individuals who provide work direction and leadership directly to AECOM field personnel and/or our subcontractors for construction/demolition activities or tasks that have construction/industrial-like hazards. These supervisors must be knowledgeable of construction hazards and controls because they are responsible for:

- Field implementation of a construction/demolition scope of work
- Controlling performance on the job site
- Evaluating and controlling hazards & preventing site safety risks
- Intervening to prevent unsafe actions or conditions of employees, clients, and subcontractors related to construction/demolition hazards

5.4 Competent Person

A competent person is an employee who, through education, training and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, S3AM-202-PR, explains the roles, responsibilities and procedures of naming a competent person. Complete the table below and include a S3AM-202-FM1 Competent Person Designation Form for each AECOM competent person (subcontractors to use an equivalent process).

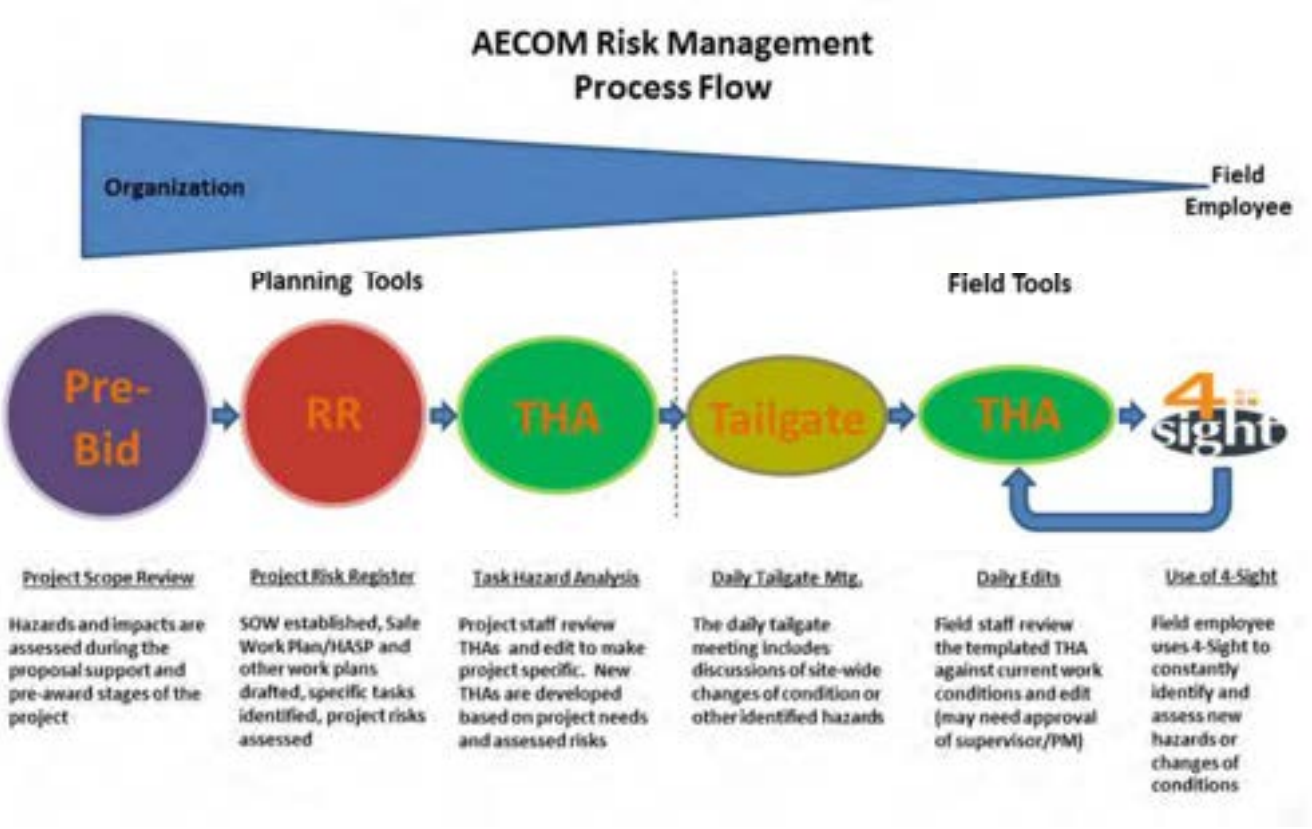
These activities require a competent person. Mark all that apply and list the name of the person.

Competent Person Log

Activity / Area of Competency		Name of Person and/or subcontractor providing this person
☐	Asbestos	
☐	Assured Equipment Grounding Conductor	
☐	Blasting & Explosives	
☐	Concrete & Masonry Construction	
☐	Confined Spaces	
☐	Control of Hazardous Energy (Lockout-Tagout)	
☐	Crane Assembly / Disassembly	
☐	Cranes & Derricks	
☐	Demolition	
☐	Electrical Wiring Design & Protections	
☐	Elevated Work Platforms & Aerial Lifts	
☐	Fall Protection	
☐	Hearing Protection	
☐	Heavy Equipment	
☐	Ionizing Radiation	
☐	Lead	
☐	Material Hoists & Personnel Hoists	
☐	Respiratory Protection	
☐	Rigging Equipment	
☐	Scaffolds	
☐	Stairways & Ladders	
☐	Steel Erection	
☐	Trench & Excavations	
☐	Underground Construction	
☐	Welding & Cutting	

6. Hazard Assessment and Control

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See S3AM-209-PR, Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.



6.1 SH&E Procedures

All AECOM SH&E procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page. Programmatic procedures referenced in this document (for example SH&E Training) do no need to be printed for inclusion in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment C**.

6.2 Task Hazard Assessments (THAs) and Daily Tailgate Meeting form

THA forms (a blank version is located in S3AM-209-PR) shall be prepared for each task to be performed as part of the scope of work. This includes driving to the site, parking, and walking as well as the hazards, associated risk, and appropriate controls for all other work activities. The DCS Americas Templated THA Library may also be used to find previously approved THAs, though these should be modified to be project and site-specific. The preparer shall have one THA form for each task in the Scope of Work found in this work plan (**Attachment B)** and shall also include blank copies.

In the field, all employees and visitors shall review the daily the THAs and complete and sign the Daily Tailgate Meeting Form S3AM-209-FM5. Many times, when employees arrive in the field, situations are different than originally planned for or additional job steps are required. The THA asks workers update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work is not allowed to proceed.

6.2.1 Hazard Categories

THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

- Biological
- Chemical
- Electrical
- Gravity
- Mechanical
- Motion
- Pressure
- Noise
- Radiation
- Thermal

6.3 4 Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- What am I about to do?
- What could go wrong?
- What could be done to make it safer?
- What have I done to communicate the hazard?

6.4 Speak Up/Listen Up

All AECOM employees have a responsibility to help create the environment where the expectation is Safety for Life. Speak Up/Listen Up (SULU) is a technique to steward jobsite safety by utilizing 4-Sight as a basis for safety feedback conversations. SULU has two main parts:

- **Speak Up** where employees use three simple steps when providing feedback to others about unsafe acts:

  - Ask to discuss their hazard assessment or 4-Sight for the task
  - Get a commitment from the employee to apply the hazard controls and perform the task according to the accepted procedures
  - Follow up to ensure the employee is working safely

- **Listen Up** where employees use two simple steps when responding to safety feedback:
  - Listen – Focus on the message, not the messenger
  - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the work day to create clear expectations of how work should be performed. All employees should recognize safe work behaviors in order to reinforce them and keep them going. An occasional correction is much more effective when employees are frequently encouraged and positively recognized for their safe actions. Managers and supervisors should be having SULU conversations during site visits and ensure peer to peer and site supervisor to crew SULU conversations are being held.

7. Physical and Biological Hazard Assessment

A physical hazard is a hazard that threatens the physical safety of an individual; contact with the hazard typically results in an injury. The following table summarizes the physical hazards or activities containing physical hazards present at the site and the associated procedures that address protection and prevention of harm.

All checked procedures MUST be included in **Attachment C** for implementation and reference.

Check all applicable hazards/ activities and add site specific description of the hazard.

	Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
☐	Abrasive Blasting		S3AM-335-PR
☐	Aerial Work Platforms		S3AM-323-PR
☐	All-Terrain Vehicles		S3AM-319-PR
☐	Blasting and Explosives		S3AM-336-PR
☐	Bloodborne Pathogens		S3AM-111-PR
☐	Cofferdams		S3AM-344-PR
☐	Cold Stress		S3AM-112-PR
☐	Compressed Air Systems and Testing		S3AM-337-PR
☐	Compressed Gases		S3AM-114-PR
☐	Concrete Work		S3AM-338-PR
☐	Confined Spaces		S3AM-301-PR
☐	Corrosive Reactive Materials		S3AM-125-PR
☐	Cranes and Lifting Devices		S3AM-310-PR
☐	Demolition		S3AM-339-PR
☐	Diving (scientific and commercial)		S3AM-334-PR
☐	Drilling, Boring & Direct Push Probing		S3AM-321-PR
☐	Electrical Safety		S3AM-302-PR
☐	Excavation		S3AM-303-PR
☐	Fall Protection		S3AM-304-PR
☐	Flammable and Combustible Liquids		S3AM-126-PR
☐	Gauge Source Radiation		S3AM-122-PR
☐	Hand and Power Tools		S3AM-305-PR
☐	Hazardous Waste Operations		S3AM-117-PR
☐	Heat Stress		S3AM-113-PR
☐	Heavy Equipment		S3AM-309-PR
☐	High Altitude		S3AM-124-PR
☐	Highway and Road Work		S3AM-306-PR
☐	Hoists Elevators and Conveyors		S3AM-343-PR

☐	Hot Work		S3AM-332-PR
☐	Ladders		S3AM-312-PR
☐	Lockout Tagout		S3AM-325-PR
☐	Machine Guarding Safe Work Practice		S3AM-326-PR
☐	Marine Safety and Vessel Operations		S3AM-333-PR
☐	Material Storage		S3AM-316-PR
☐	Mine Site Activities		S3AM-341-PR
☐	Mining Operations		S3AM-345-PR
☐	Noise		S3AM-118-PR
☐	Non-Ionizing Radiation		S3AM-121-PR
☐	Overhead Lines		S3AM-322-PR
☐	Powder-Actuated Tools		S3AM-327-PR
☐	Powered Industrial Trucks		S3AM-324-PR
☐	Radiation		S3AM-120-PR
☐	Railroad Safety		S3AM-329-PR
☐	Respiratory Protection		S3AM-123-PR
☐	Scaffolding		S3AM-311-PR
☐	Steel Erection		S3AM-340-PR
☐	Temp. Floors, Stairs, Railings, Toe-boards		S3AM-342-PR
☐	Underground Utilities		S3AM-331-PR
☐	Underground Work		S3AM-330-PR
☐	Wildlife, Plants and Insects		S3AM-313-PR
☐	Working Alone		S3AM-314-PR
☐	Working on and Near Water		S3AM-315-PR

7.1 Biological Hazards – Pandemic Virus

COVID-19 is a disease that results from infection of the virus identified as SARS-CoV-2. SARS-CoV-2 is a Coronavirus, one of a large family of viruses found in both animals and humans. Some infect people and are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) with symptoms such as fever, cough and shortness of breath. There currently is no human vaccine available for this virus.

Key AECOM resources can be found at the AECOM Ecosystem Coronavirus Information Center on the Eocsystem homepage or at this link, the Coronavirus Smart Card, and the AECOM Pandemic Procedure: SR1-003-PR2. Additional resources can be found at the following non-AECOM websites:

- Center for Disease Control and Prevention (CDC).
- World Health Organization (WHO).

9. Personal Protective Equipment

PPE is considered the last line of defense in hazard control. PPE is meant to protect workers when all other methods (elimination, substitution, engineering, and administrative) have been exhausted. All employees must be trained in the proper use and maintenance of PPE. See Procedure S3AM-208-PR, Personal Protective Equipment.

A PPE assessment (see S3AM-208-FM1) can be performed to help determine PPE requirements. PPE upgrades for individual tasks or steps of a task are to be identified in the appropriate THA(s).

9.1 Site Minimum Personal Protective Equipment

Unless otherwise excluded by an approved Management of Change (MoC), the following personal protective equipment is required by AECOM and/or client procedures and requirements and shall be worn on site outside of designated "Safe Zones", such as offices and parking lots. Do not downgrade the PPE specified in the THA and/or this HASP without review and approval.

Site Minimum PPE

✓ Hard hat	✓ Safety-toe work boots
✓ Safety glasses with side shields (may be clear or shaded)	✓ Long pants
✓ Reflective Vest	✓ Shirt with sleeves (short or long – cover shoulders)

9.2 Additional Personal Protective Equipment Needed on Site

The following PPE is required by the host facility, task hazard assessment (THA), or prescribed upgrades in response to air monitoring response (action) levels.

Face/ Eyes		Head/ Ears	
☐ Spoggles (Safety Glasses with foam liner for dust protection) ☐ Welding Mask/Goggles	☐ Chemical Goggles ☐ Face Shield (splash) ☐ Face Shield (impact)	☐ Hard hat with chin strap ☐ Climbing helmet ☐ Wide Brimmed Hat ☐ Insect net	☒ Earplugs ☐ Over-ear Hearing Protection ☐ Other: [specify]
Hands		**Legs/ Feet**	
☒ Cut, Abrasion and/or Puncture Resistant ☐ Impact-resistant ☐ Leather	☐ Chemical Resistant: ☐ Nitrile ☐ PVC ☐ Other:	☐ High Ankle Boots ☐ Snake gaiters or chaps ☐ Rubber Boots ☐ Puncture-resistant boots or insoles	☐ Metatarsal Guards ☐ Electrically-resistant boots ☐ Waders ☐ Disposal boot covers or booties
Body		**Equipment**	
☒ Sunscreen ☒ Insect Repellent (DEET) ☐ Permethrin Applied to Clothing ☐ Long-sleeved Shirt ☐ High-visibility Vest: Class [ ] ☐ High-visibility Pants Class [ ] ☐ Disposable Coveralls		☐ Fall Protection (See Fall Protection Plan for details) ☐ Personal Floatation Device: ☐ Type I ☐ Type II ☐ Type III ☐ Type V – Auto-inflate with Type II performance ☐ Type V – Mustang Suit ☐ Other: *(specify)*	

☐ Flame Retardant Clothing: Rating [ ] Weight: [ ]	

Equipment (select all that apply)	
☐ Air and Noise Monitoring	☐ Weather, Heat and Cold Stress Monitoring:
☐ Dosimeter	☐ Portable weather station or meter
☐ See Section 9.1 above	☐ Smart phone with weather app
☐ Other: [specify]	☐ Wet Bulb Globe Thermometer (WBGT)
☐ Communication Beyond Cell Phones	☐ Other: [specify]
☐ Portable, hand-held radio	☐
☐ Satellite phone	☐ Air horn
☐ Other: [specify]	☐ Bear spray
☐ Traffic / Work Area Controls:	☐ Emergency Rations
☐ See Section 11.1	☐ Emergency Shelter(s)
☐ Other: [specify]	☐ Other: [specify]

10. Site Control

The purpose of site control is to protect the public from inadvertently coming into contact with site hazards and to protect AECOM employees being impacted by hazards. This section details the equipment and actions needed to promote optimal site control.

10.1 Site Work Zones

Site layout and site control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work. Consider the following items when planning the site layout and controls:

- "Line of Fire" hazards- overhead utilities, falling/ tipping equipment, release of energy/ pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Traffic control for site vehicles/ equipment (public traffic control requires Traffic Control Plan)
- Restricted access for areas requiring special training, skills, or certifications
- Restriction of work near railroads
- Presence or creation of excavations
- Loading/unloading areas
- Portable restrooms
- Dumpsters and bins
- Equipment lay down
- Heavy equipment parking
- Overnight safety and security needs

Check the description of the site controls **already** in place:

☐ Work area is within a facility/property with secure and restricted access provided by client or third party
☐ Work area is enclosed within a facility/property, but access is not restricted via locks, guards, or gates
☐ Work area is on a property that is open, but access by the public is unlikely
☒ Work area is on a property that is open and access by the public is likely
☐ Work area is in a roadway or right of way of a roadway (Traffic Control Plan required S3AM-306-PR)
☐ Work area is on or near railroad, including right of way, active lines and crossings
☐ Other: [Insert description]

Check and describe the site controls that need to be added to protect the public and the AECOM work team.

	Control Item	Description of Type and Application
☐	**Fence**	
☐	**Locks**	
☒	**Barricades**	Around any open drill holes

☐	**Cones**	
☐	**Tape**	
☐	**Hole Covers**	
☐	**Other:**	

10.2 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations often present a need for added coordination and communication to address hazards that are presented by multiple operations. .

Simultaneous Operations – Within the Site

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	THA Reference where hazard is addressed
N/A				

Simultaneous Operations – Neighboring Sites

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	THA Reference where hazard is addressed
N/A				

10.3 Site Security

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.).

All facilities maintained by AECOM must maintain an Operational Security Plan (OSP) describing the conditions of the site or facility and identifying basic emergency response procedures. This requirement applies to field trailers maintained by AECOM for use on project sites. A blank OSP template is available in Global Resilience Group Standard GRG-001-RP4. The OSP must be maintained by the Project Manager at the field trailer and a copy provided to the Global Resilience Group, which can be found on Ecosystem.

11. Emergency Response

Any situation that has resulted or poses an imminent threat to persons, property and/or the environment constitute an emergency an require immediate action by the individual discovering and/or involved in the situation. Immediate actions start with the signaling of an emergency that is accompanied by a ceasing of site activities (i.e. Stop Work). When safe to do so, immediate actions will be taken to prevent an imminent risk from resulting in an incident and/or minimize the potential for an escalation in the severity of the incident. Immediate actions for reasonably credible emergency situations or scenarios are described within the following section of this Emergency Response Plan (ERP).

11.1 Communication – Method of Signaling an Emergency

In addition to verbal communication amongst the field team, the following methods of communicating or signaling an emergency will be used:

☒ Cell Phone ☒ Hand Signal	☒ Radio (Channel No. [Insert])		☐ Satellite Phone
☐ Host Facility Alarm (specify):	[Insert Description]	=	[Insert Meaning]
	[Insert Description]	=	[Insert Meaning]
	[Insert Description]	=	[Insert Meaning]
	[Insert Description]	=	[Insert Meaning]

11.2 Muster and Shelter-in-Place Locations

In the event of an emergency situation or imminent threat persons, property and/or environment, workers will report to the appropriate muster and/or shelter-in-place location. Workers will remain at the muster or shelter-in-place location until a headcount is completed and any “all clear” is issued by the proper authority for the site, unless it is unsafe to remain at that location.

Primary Muster Location:	Will be determined when on site.
Secondary Muster Location:	Will be determined when on site.
Shelter-in-Place Location:	] Will be determined when on site.

11.3 Location of Emergency Equipment

Site personnel will be made aware of the location of emergency equipment that can aid in the response to an emergency situation or imminent threat to persons, property and/or the environment during the site orientation, daily toolbox safety meetings, and/or crew reviews.

Item(s)	Item Description	Location(s)
First Aid Kit(s)	Unknown Type	• Field vehicles
Fire Extinguisher(s)	Unknown Type and Size	• Field Vehicles
Spill Kit(s)	Unknown Size	• Field Vehicles

11.4 Emergency Responders and Resources

In the event of a **life-threatening or critical emergency**, AECOM employees should immediately engage emergency responders and/or resources, as appropriate, to the type of emergency. Steps should be taken to meet and escort emergency responders and/or resources to location of the emergency whenever possible.

Emergency Responders

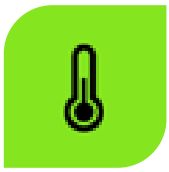
Site Resource(s):			
Fire:	Kingwood Volunteer Fire Department		304-329-0101
Medical Transport:	Land:		
	Air:		
	Water:		
Police:	Preston County Sheriff		304-329-611
Poison Control:			
Pollution Emergency:			
INFO TRAC:	(AECOM's Account Number: 74984)		1-800-535-5053

Utility and Pipeline Owners (For utility and pipeline related emergencies only)

Utility/Pipeline Name	Provider/Facility Owner	Contact No.
Cable		
Electric		
Natural Gas		
Phone		
Water		
Sewer		
Call Before You Dig	(Utility One-Call Locating)	811
Call Before You Dig	(Utility One-Call Locating)	Insert Provincial Number

11.5 Fitness for Duty and Illness Reporting During Pandemic

- AECOM employees should always live our life-preserving principle of "Fitness for Duty", which requires employees to stay home from work when they are sick, as they are not "Fit for Duty" when ill. During times of pandemic, the importance of this step is increased. If you experience signs/symptoms of illness (see images below) or find out that you have come into contact with a person who has been confirmed positive with the Coronavirus, notify the site supervisor and the project manager, your Area, Regional, or Business Line SH&E Manager, and go home and/or stay home. Notify the AECOM Incident Reporting Hotline (**1-800-348-5046)** and/or the AECOM Nurse Line (**1-512-419-5016).** Managers will work with the local SH&E and/or Resiliency teams to respond according to the AECOM Pandemic Procedure: SR1-003-PR2.



FEVER

TIREDNESS, CONFUSION

DRY COUGH

SHORTNESS OF BREATH

NASAL CONGESTION, SORE THROAT OR RUNNY NOSE

BLUE LIPS OR FACE

PERSISTENT PAIN OR PRESSURE IN THE CHEST

IF ANY OF THESE SYMPTOMS ARE IDENTIFIED, SEEK MEDICAL ATTENTION!

12. Notifications and Reporting

NOTE! In the event of a life threatening emergency, call 911 FIRST. A life threatening emergency can include:

- ✓ Loss of consciousness
- ✓ Seizures
- ✓ Uncontrollable loss of blood
- ✓ Broken bones
- ✓ Severe allergic reaction
- ✓ Head or spinal cord injury
- ✓ Heat stroke
- ✓ Abdominal Trauma
- ✓ Difficulty breathing
- ✓ Cardiac Arrest

Once immediate actions have been taken, if safe to do so, notifications (verbal) and reporting (written) must be immediately completed. Notifications serve to engage additional resources in the management of the emergency situation and initiate additional processes such as medical case management, spill response, incident investigation, etc. Reporting initiates the formal documentation process and supports the development of key learnings to prevent a reoccurrence.

12.1 Initial Notifications

The person observing and/or involved with the emergency situation is required to make the following initial notifications as soon as reasonably possible:

- **Call #1 – AECOM Site Supervisor or Site Safety Officer**

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Primary Site Supervisor:	Chris Channell	304-381-9267	304-290-8127
If unavailable, Alternate Site Supervisor:			
If unavailable, Site Safety Officer:	Varies	Varies	Varies
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

- **Call #2 – DCS Americas Incident Reporting Hotline**

1-800-348-5046	
DIRECT TOLL-FREE	Hours of Operation: 24 Hours/Day; 7 Days/Week
For injuries and illnesses to AECOM Employees, you should be transferred by the hotline to the AECOM Occupational Nurse. Do not request nurse assistance for subcontractor injuries.	

AECOM Occupational Nurse - 1-512-419-5016

DIRECT	Hours of Operation: 24 Hours/Day; 7 Days/Week

- **Call #3 – Affected Employee's Direct Supervisor**

Employees are encouraged to program their direct supervisor's phone numbers into their cell phone.

- **Call #4 – Vehicle Management or Insurance Provider *(Motor Vehicle Accidents Only)***

Employees involved in motor vehicle accidents or who have discovered property damage caused to motor vehicles should call the appropriate party: ARI Fleet Management (Fleet vehicles only) 1-800-422-7647	
DIRECT TOLL-FREE	Hours of Operation: 24 Hours/Day; 7 Days/Week
Rental Company (Rental vehicles only)	
Refer to your rental agreement for contact numbers and hours of operation	
Personal Insurance Provider (Personal vehicles used for business travel only)	
Refer to your personal insurance policy for contact numbers and hours of operation	

12.2 Additional INTERNAL AECOM Notifications

The AECOM Site Supervisor will make the following additional internal notifications. If the AECOM Site Supervisor cannot be reached or is not capable of making the notifications, the notifications will be made by an alternate AECOM Site Supervisor or AECOM Site Safety Officer.

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
AECOM Project Manager:	Chris Channell	304-381-9267	304-290-8127
If unavailable, Alternate AECOM Project Mgr.:	[Required]	[Required]	[Recommended]
AECOM Area SH&E Manager:	Alberto Munuera	~~301-820-3000~~	7574084276
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

The Project Manager will perform any additional internal notification requirements based on the requirements of their region, business line, or client account.

12.3 Subcontractor and/or Third-Party Contacts

The following subcontractor(s) and/or third parties are involved with field activities at the site under a contractual relationship with AECOM, a contractual relationship with an AECOM subcontractor, or as part of a separate, but collaborative effort on behalf of the client.

For emergencies affecting subcontractors and/or third-parties, the AECOM Site Supervisor, or PM for projects without full-time AECOM presence, should ensure that Subcontractor personnel follow their own internal incident reporting processes.

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Primary Contact Person (Subcontractor Project Manager): Downstream Strategies	[Required]	[Required]	[Recommended]

Subcontractor Injury Report Line (if available):Enviroporbe Drilling	[Required]	[Required]	[Recommended]

Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone

12.4 Internal Reporting

12.4.1 Incident and Near Miss Reporting

All incidents and near misses (i.e. incidents without consequences), regardless of type and perceived severity, must be reported within **IndustrySafe** (AECOM's SH&E Database) within the timeframes listed below:

Incident Type	IndustrySafe Reporting Timeframe
Significant Incident, including any injury to an AECOM employee or Subcontractor	Within 4 hours
All Other Incidents	Within 24 Hours

Note: Only the basic facts, who, what, when, where and how, are needed to complete the initial IndustrySafe report. SH&E Managers will assist you in updating the report as additional information becomes available.

Significant incidents include:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or more than one employee being away from work for more than 3 days;
- Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than $10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;
- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed $10,000 United States dollars (USD);
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any near miss event that may have resulted in any of the above consequences, but because of "luck" did not result in harm to persons, property or the environment.

Other incidents include:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including non-work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public or client representative occurring on an AECOM-controlled work site;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);
- Any incident involving company-owned, rented or leased vehicles (including personal vehicles used for company business); and/or
- Any failure to comply with requirements of a regulatory permit issued to AECOM.

12.4.2 Safety Observation Reporting

All safety observations must be reported within **IndustrySafe** **or** **Lifeguard** (AECOM's SH&E Databases), as dictated by the AECOM Project Manager, in a timely manner. It is recommended that safety observations are reported within 7 to 14 days of the observation.

12.4.3 SH&E Database Access

Incidents, near misses, and audits/inspections must be entered into IndustrySafe, which is one of AECOM's SH&E Databases. Safety observations may also be entered into IndustrySafe at the AECOM Project Manager's discretion. IndustrySafe can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. IndustrySafe may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

↑ Incidents, Near Misses, Audits/Inspections and Safety Observations ↑

Safety observations may also be entered into Lifeguard, which is one of AECOM's SH&E Databases, at the AECOM Project Manager's discretion. Lifeguard can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. Lifeguard may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

↑ Safety Observations ↑

12.4.4 Reporting Assistance

If your field schedule, access to internet, and/or limited cellular phone coverage have the potential to impact timely incident, near miss, and/or safety observation reporting, please contact your AECOM Project Manager and/or SH&E Manager for assistance.

13. Response Plans: Reasonably Credible Emergency Scenarios

Based on site history, operations, and setting along with the approved scope of work, the following emergency scenarios have been determined to be reasonably credible to occur. Immediate actions and post-emergency follow-up actions, when applicable, are discussed below for each reasonably credible emergency scenario.

13.1 Injuries and illnesses

13.1.1 Immediate Actions

13.1.1.1 Engage Medical Resources

In the event of a **life-threatening or critical emergency**, AECOM employees should **dial 911 or the site-specific number** for the emergency responder and follow the recommended instructions. After dialing 911 or the site-specific number and in **less serious situations**, an injured employee or a co-worker should contact the **Incident Hotline at 1-800-348-5046** to ensure that the employee receives the best care at the best time (i.e., within the first hour following an injury or potential injury). By contacting the Incident Hotline, the worker can be connected with AECOM's nurses for first aid advice. If recommended by the nurse, the supervisor or a co-worker should drive the injured employee to the project-designated clinic or hospital.

13.1.1.2 Care for the Injured or Ill Person(s)

Employees trained in first aid, CPR and/or Automated External Defibrillators (AED) should render initial care in a manner consistent with their training. This care should be provided until the injury or illness is resolved (i.e. first aid cases) or transportation to the appropriate medical facility is arranged and present on the site (i.e. treatment beyond first aid incidents).

First Aid, CPR and AED Trained Personnel

Name	Company	Contact No.	1st Aid	CPR	AED
Go to Hospital			☐	☐	☐

13.1.1.3 Transport to Nearest Medical Facility for Treatment

For injuries and illnesses that require treatment beyond first aid, the injured/ill person(s) shall be transported to the nearest medical facility for treatment. For life-threatening or critical emergencies, Emergency Medical Services (EMS) should handle the transport. EMS will determine the hospital to which the injured/ill person(s) will be transported. The AECOM Field Supervisor and/or Site Safety Officer shall confirm with EMS the final destination of the injured/ill persons. The nearest hospital equipped for emergency medical care, driving directions and map are provided in Attachment A.

For less serious situations, the AECOM Site Supervisor, AECOM Site Safety Officer (SSO) and/or their designee shall transport and accompany the injured/ill person(s) to the nearest Occupational Clinic (preferred) or hospital, if an occupational clinic is not available, not within a reasonable driving distance or cannot be reached during their hours of operation. The nearest occupational clinic, driving directions and map are provided in Attachment A.

13.1.1.4 Engage AECOM Occupational Nurse with Medical Treatment Provider

The AECOM Site Supervisor, AECOM SSO or their designee who is accompanying the injured/ill person(s) to the medical treatment facility shall notify the AECOM Occupational Nurse of the situation, communicate the destination of the injured/ill person(s) and assist the nurse in connecting with the medical treatment provider to facilitate medical case management.

13.1.2 Follow-Up Actions

Outside of notifications and reporting, the AECOM Site Supervisor, AECOM SSO or their designee shall coordinate the post-treatment transportation of injured/ill person(s).

13.2 Motor Vehicle Breakdowns and Flat Tires

If safe to do so, remove the car from the traveled way. To the extent possible, AECOM personnel should not change flat tires or perform similar repairs.

For rental vehicles, contact the rental company

For fleet vehicles, contact **ARI Fleet Management**: **1-800-422-7647**

- **Prompt 1 – Roadside Assistance**
- **Prompt 3 – Maintenance Management**

For personal vehicles used on AECOM business, contact an emergency provider.

13.3 Motor Vehicle Collisions

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas United States or Canada travel pages. **Drivers MUST print and carry the applicable insurance policy for the rental. For company owned vehicles, drivers MUST also print and carry proof of insurance.**

13.3.1 Immediate Actions (Recommended Responses)

Assess the situation and move all occupants (except the injured) out of further harm's way.

If safe to do so, remove the car from the traveled way.

Call 911, if necessary

- If appropriate, wait for police to arrive before moving vehicles.

Provide insurance information to other drivers if necessary or requested and collect the same:

- Driver's Information:
  - Name and contact number
  - Driver's license number, expiration date and issuing state/province
  - Insurance policy number, carrier/provider and provider's contact number
- Vehicle Information:
  - Make, model and year
  - License plate/tag number and issuing state/province
  - Owner's name, address and contact number
- Passenger's Information:
  - Name and contact number
- Witness Information:
  - Name and contact number

If possible, obtain names and phone numbers of witnesses.

Sketch the accident scene and/or take photographs of the scene, if possible and **safe to do so**.

Take photographs of the damage to vehicles and property, if possible and **safe to do so**.

If police are not on scene, file an accident report at the local police station.

NOTE: DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.

13.3.2 Follow Up Actions

13.3.2.1 Police Report

- If the police were not on scene, file an accident report at the local police station.
- Include a copy of the police report with the IndustrySafe report (upload report to IndustrySafe).

13.3.2.2 Drug and Alcohol (D&A) Testing

Driver's that may have caused or contributed to motor vehicle collisions resulting in $2,500 U.S. Dollars (USD) or more in damage to individuals, vehicles and/or property shall undergo drug and alcohol testing. The AECOM Site Supervisor, AECOM SSO or designee shall:

- Contact Lindsay Scammell at **1-804-515-8552** to coordinate the drug and alcohol testing;
- Accompany and transport the driver to and from the D&A testing facility; and
- Coordinate transportation for the driver pending the results of the D&A testing.

13.4 Fire

AECOM employees are not expected to attempt to put out fires. Stop work; notify all AECOM personnel, move upwind and contact 911 and/or emergency response at the site. If employees have been properly trained in the operation of a fire extinguisher, they may attempt to put out a small fire, provided that the following conditions are met:

- The fire must be small (i.e., smaller than a trash can) and in its early stages
- The employee must have an escape route
- The employee must be trained and know they have the right type of extinguisher
- The employee must be safe from toxic gases
- There must be no hazardous conditions that could quickly accelerate the fire (i.e., presence of chemicals, especially dry grass, etc.)

Above all, if in doubt, the employee must not attempt to fight the fire.

13.5 Inclement Weather

Inclement weather includes but is not limited to heavy rain or storms and associated floods, heavy winds, lightning, snow storms and blizzards, and sand storms and haboobs. Weather conditions which are normal or expected can cause hazards, such as cold weather in winter or excessive heat in the summer. The best approach to preventing exposure to these hazards is project planning. Where possible, plan to perform work at seasonably appropriate times of the year. Starting several days to a week prior to field work, begin reviewing projected weather forecasts to determine if work should be delayed, or accelerated, to avoid days with higher chances of inclement weather. Weather conditions can change rapidly, however, and field personnel and the project managers should be prepared to utilize Stop Work Authority if uncontrolled hazardous situations develop.

Additional precautionary measures for reasonably foreseeable weather conditions are provided below.

13.5.1 Ambient Temperature (heat or cold)

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. Where possible, plan work to avoid the hottest (or coldest) part of the day. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. Use vehicles or covered area for shelter and take breaks as needed.

In hot weather, keep hydrated, prevent over exposure to the sun with clothing or use of sun cream and take frequent breaks out of the sun. Use the "buddy system" to monitor effects of heat stress as it can be difficult to identify the impacts of heat in yourself. Create shaded work areas if appropriate. Use a strong sunscreen and wear a full-brimmed hat when in the sun to protect the back of the neck and shoulders. Refer to SH&E Procedure S3AM-113-PR1, Heat Stress, for more information.

In cold/wet weather, be aware of potentially slippery surfaces (wet or icy). Wear boots with good tread and carefully select your walking path to eliminate or reduce the need to traverse wet or icy surfaces. Wear warm / waterproof clothing and take breaks in a warm location. If heavy snows or icy weather are anticipated, consider your driving route prior to leaving for the site or returning at the end of the day. It may be necessary to stop work earlier in the day to allow time to return to lodging if road conditions are at risk of deteriorating. Refer to SH&E Procedure S3AM-112-PR1, Cold Stress, for more information.

13.5.2 Storms

Heavy or unexpected storms, whether they be rain, snow, or wind, represent a changed condition in which multiple hazards could be present. Stormy weather increases hazards at the job site by making travel more treacherous, both on foot and in vehicles. Visibility can be reduced. Manual tasks become more difficult as conditions worsen, increasing the chances of injury. Mental states may deteriorate increasing the risks of hazards attributable to frustration or exhaustion. Other hazards may exist; for example, winds could cause objects to blow away or strike workers or equipment or blow dust or debris into eyes. For these reasons, be aware of changing weather conditions and be prepared to stop-work to secure the project site and depart prior to storms whenever possible. If storms suddenly develop, remember that the loss of equipment or materials is far preferable to taking risks of injury by attempting to demobilize when storms are active.

13.5.3 Lightning

One of the most serious weather threats is lightning. A two-tier notification system consisting of alerts and stand downs shall be used to allow ample time for field teams to cease their activities, secure the work area, and seek shelter.

Immediate Actions – Alerts and Stand Downs

Alerts are issued by AECOM Site Supervisor and/or AECOM Site Safety Office when inclement weather, including lightning is detected within 50 miles (80 km) of the site. Alerts indicate that work crews should be prepared to cease all field activities and secure the work area. Stand Downs are issued by AECOM Site Supervisor and/or AECOM Site Safety Officer when inclement weather is detected within 30 miles (50 km) of the work area. Stand downs indicate that all work crews shall immediately cease all field activities and seek shelter. Stand downs remain in effect until the inclement weather has passed. For thunderstorms, the stand down will remain in effect for a minimum of 30 minutes following the last detection of lightning.

Immediate Actions - Guidance for Lightning

Go Indoors: Remember the phrase, "**When thunder roars, go indoors**." If you see lightning and cannot count to 30 before hearing thunder, the lightning is too close for comfort. Find a safe, enclosed shelter when you hear thunder. Safe shelters include homes, offices, shopping centers, and hard-top vehicles with the windows rolled up.

Crouch Close to the Ground and Separate: If you are caught in an open area, crouch down in a ball-like position (**feet and knees together**) with your head tucked and hands over your ears so that you are down low with minimal contact with the ground. **Do NOT lie down**. Lightning causes electric currents along the top of the ground that can be deadly over 100 feet away. Crouching down is the best combination of being low and touching the ground as little as possible.

Separate: If you are in a group during a thunderstorm, separate from each other. This separation will reduce the number of injuries if lightning strikes the ground.

If a person is struck by lightning:

- Call 911 or other Emergency Services Contact.
- Assess the scene to ensure that continuing risk to rescuers does not exist if lightning strikes. For other electrical-related emergencies (non-lightning), ensure the source of electricity has been deenergized.
- Check to see if the victim is breathing and proceed with CPR if victim is not breathing

14. Personnel Acknowledgement and Disclaimer

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the [site name] site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work and will comply with the provisions contained therein. The employee understands that they are NOT to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the **Incident Hotline at 800-348-5046** for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

Print Name	Signature	Organization	Date

14.1 Disclaimer:

This HASP, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third party contractors on industrial sites or projects where AECOM is providing engineering, construction management or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM Corporation shall have no responsibility therefore. The existence and use of this Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

Attachment A

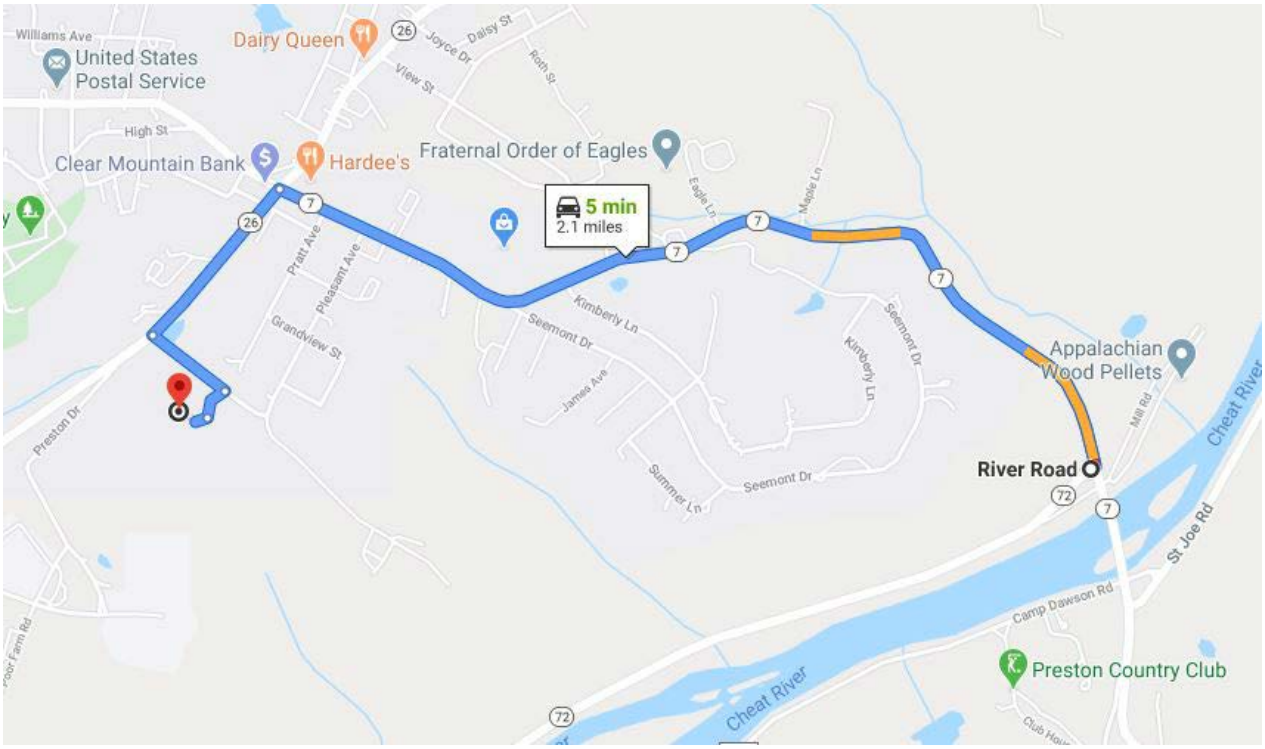
Hospital and Clinic Directions/ Maps
Incident Reporting and Response Flow Chart

Attachment A. Hospital and Clinic Directions/ Maps Incident Reporting and Response Flow Chart

Nearest Hospital

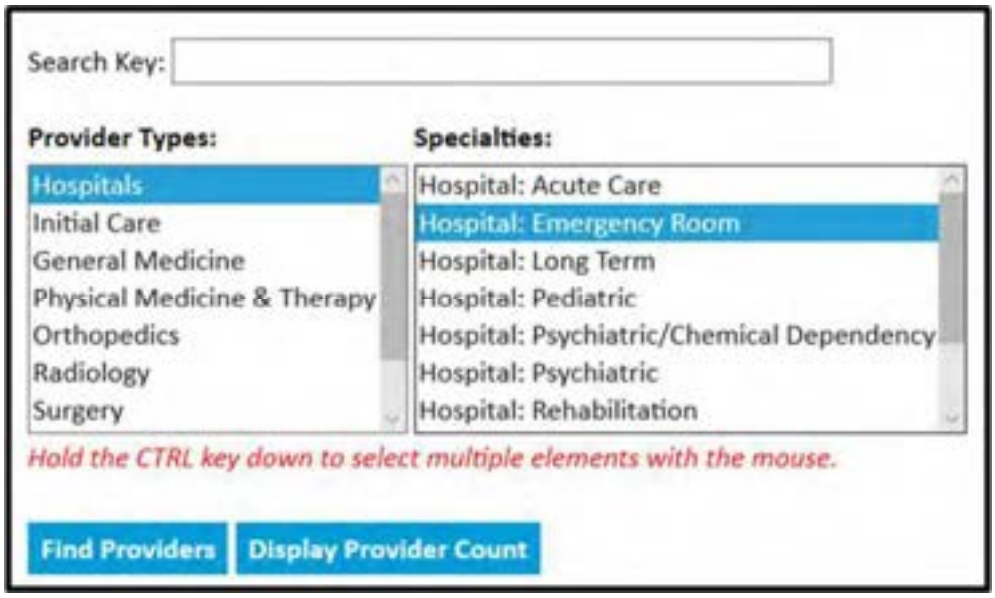
Mon-Health Preston Memorial Hospital ..... [1-304-329-1400]

Address:	150 Memorial Drive		
City:	Kingwood		
State/Province:	WV	Postal/Zip Code:	26537
Estimated Travel Time:	5 Minutes	Distance:	2.1 Miles
DRIVING DIRECTION			
• From Site, Turn Left onto WV-7 and Head North • Turn Left onto Kingston Road • Turn Left onto Memorial Drive • Turn Right • Arrive at Hospital on the Right			
MAP TO HOSPITAL			

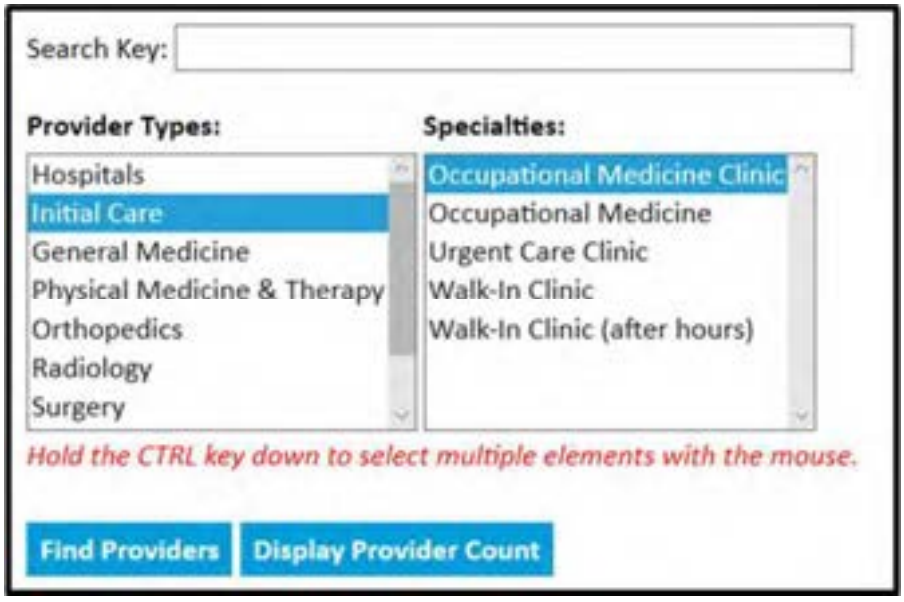


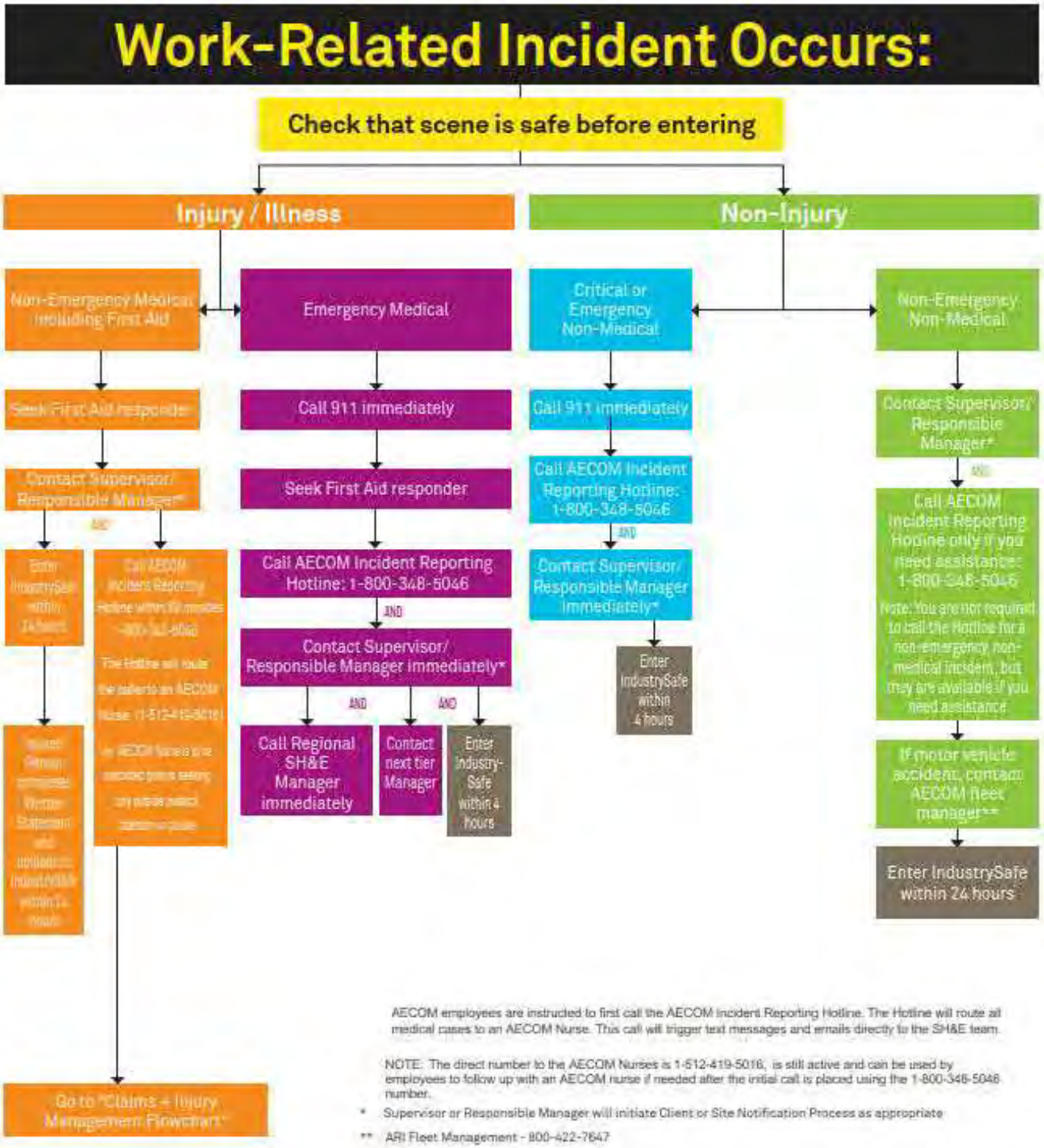
- Go to https://viaoneprovidersearch.net
- User name: Sedgwick2300
- Password: 2300
- Select one of the buttons:
  - Address Search for nearest to a specific site,
  - Name search to verify a previously-selected clinic/hospital is in the network, or
  - Region search best for projects with multiple sites in a geographical area].

- On the following screen, to search for Hospitals with emergency room care, select “Hospitals” and “Hospital: Emergency Room Care”.



- To search for Occupational Clinics, select “Initial Care” and “Occupational Medicine Clinic”.





Updated February 2020

Attachment B

Project THA Forms, and Tailgate Safety Meeting Forms

Each discrete task being performed during the project (i.e., Driving, Inspection, Sample Collection, etc.) requires a Task Hazard Assessment (THA; form S4[DCS]AM-209-FM6-A). If you don't have a THA for a task, obtain or develop one. The DCS Americas Templated THA Library may also be used to find previously approved THAs.

The THAs MUST be reviewed at the start of each shift and signed by all staff involved in the operation. The THAs should be consulted and updated throughout the day if conditions change using the 'On-Site Edits' lines.

Insert Task Hazard Analyses here. Include these documents after this cover sheet in the final HASP.

The preparer shall download a sufficient number of blank copies of the Tailgate Meeting Form (S3AM-209-FM5) to use each day of field work, and blank THA forms so that new task can be performed, if not covered by previously-prepared THAs. A THA must be in hand prior to starting to perform work on any task.

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Cheat River Rail-Trail **Date:** March 20, 2020

Prepared By: Lee Shields **Approved By:** Alberto Munuera

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify elimination, substitution, engineering & administrative controls & any specific required PPE	
ACTIVITY 1 – Performing Site Visit and Soil Sampling	Slips trips and falls	8	Slip-Trip-Fall hazards are common at field sites due to various obstructions, weather conditions, and human error; do not walk with your hands full. Keep cell phone camera and clipboard/writing items tucked in your lower back pants and/or safety vest pocket. Puncture resistant gloves. While it is difficult to eliminate all slip-trip-fall hazards, the risk of injury can be minimized by using safe work practices and following the procedures outlined below: • Avoid uneven terrain and wet surfaces • Keep the work area free of obstructions • Plan your path and watch where you step • Monitor work area for good housekeeping practices. • Be alert to weather conditions. • Use designated walkways and routes. • Wear appropriate safety footwear – with good grip, ankle support, toe and mid sole protection, etc. • Ensure there is sufficient light for the tasks being undertaken. • Hold the handrail when using stairs. • Avoid stepping on debris, loose sheets, temporary hole covers or manhole covers. • Do not undertake tasks whilst walking; e.g. note taking / talking on mobile phone. • Review site conditions including areas of uneven pavement, oily staining, tight openings, stairs, etc. , do not run. • Stay off steep hillside, loose soils/gravel on a hill or parking lot, and stained/wet areas.	2

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			• Stay proper distance from open service pits on main floor level (no closer than 6 ft from edge) Refer to SH&E Procedure S3AM-013-PR1, Housekeeping, for more information	
	Wildlife, Plants, and Insects	8	Keep a close eye on your surroundings; avoid an area that might contain harmful plants, animals, or insects. Avoid contact with bird droppings. If unable to avoid wear protective clothing to avoid contact with skin.	3
	Weather Conditions Hazards	8	Monitor weather conditions and changes to weather during work. In inclement weather a review of the tasks and procedures should be made, and if necessary work should be stopped and advice sought from the PM prior to re-commencing activities. Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. Use vehicles or covered area for shelter and take breaks as needed In cold/wet weather, be aware of potentially slippery surfaces (wet or icy). Wear warm / waterproof clothing and take breaks in a warm location. In inclement weather stop work if necessary and seek advice sought from the PM prior to re-commencing activities. Refer to SH&E Procedure S3AM-113-PR1, Heat Stress, for more information	3
	All-Terrain Vehicle Operation	12	• Consult S3AM-319-ATT1 ATV Safety for additional operational guidance. All-Terrain Vehicles (S3AM-319-PR1) Revision 0 March 1, 2016 PRINTED COPIES ARE UNCONTROLLED. CONTROLLED COPY IS AVAILABLE ON COMPANY INTRANET. 4 of 5 • Wear helmets, seat belts and protective equipment at all times, including while loading or unloading ATVs from a truck or trailer. • Never attempt to cross, climb or descend a hill when doing so may not be within the capability of the operator or the ATV (e.g. too steep, unstable terrain, etc.).	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			• Do not carry passengers on ATVs unless they are designed to carry passengers (equipped with passenger seats and seatbelts). Allowances may be made in emergency situations. • Start all ATVs with the brake on and in park/ neutral. Never start when in gear. • Use low gear when operating the ATV off road. • Utilize established paths/routes where possible and obey all posted speed limits. • The use of cellular phones while operating an ATV is prohibited. • The use of alcohol or drugs prior to or during operation of an ATV is prohibited. • The ATV will not be operated on side slopes and inclines/declines in excess of that specified by the manufacturer. o In the absence of specification, operation shall not occur on side slopes greater than 20 degrees or inclines/declines greater than 30 degrees. o Use extra caution when loading/unloading an ATV from a ramp or bank. Confirm that the angle is suitable and that the ramps or terrain have suitable width and adequate grip for the ATV's tires. • Prior to putting an ATV in motion, confirm that hands and feet are properly positioned with no interference from other tools or baggage. • Maintain complete control over the ATV at all times. • Do not leave the controls unless the ATV is secured against unintentional movement by an effective method of immobilizing the equipment (e.g., a hand brake or winch). • Drive with courtesy and caution, respecting environmental and trail conditions and not operating the ATV in an erratic or unsafe manner. • As required, ATV's shall be equipped with supplementary emergency equipment, applicable to the situation.	

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			• Attach loads in accordance with manufacturer's specifications (e.g. under the vehicle on the frame, hitch, load limitations, etc.). Mounting equipment on the rear of the vehicle may increase the chance of a rear turnover. Also, tying a load to a bar behind the ATV seat can cause a rear turnover if the pull is too large. • During operation, if a collision (with a rock, tree, another ATV, etc.) appears likely, safely steer in an effort to avoid. As a last resort, roll off the ATV while trying to push the body as far from the vehicle as possible. • Do not operate an ATV on public roads. It is illegal to do so. Collisions with automobiles on public roads are one of the most common causes of fatal ATV accidents.	
	Lifting and Transporting Items	10	When having to transport and lift items: • Be aware of potential back injuries and ensure correct techniques for lifting and bending are used; • Minimize manual handling activities and loads Use lifting aids where practical, e.g. trolleys. Do not lift more than 50lbs – evaluate max. weight to lift depending of activity. Use proper tools for each task. Avoid using tools in bad conditions, replace them if observed. • Use proper gloves. Check S3AAM_014_PR_Manual Material Handling for further reference.	4
ACTIVITY 2 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
ACTIVITY 3 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
ACTIVITY 4 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
ACTIVITY 5 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
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	Click here to enter text.	#	Click here to enter text.	#
ACTIVITY 6 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
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ACTIVITY 7 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
ACTIVITY 8 – Click here to enter text.	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
	Click here to enter text.	#	Click here to enter text.	#
ACTIVITY 9 – Click here to enter text.				

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Click here to enter text.	Click here to enter text.	Click here to enter text.
2.	Click here to enter text.	Click here to enter text.	Click here to enter text.
3.	Click here to enter text.	Click here to enter text.	Click here to enter text.
4.	Click here to enter text.	Click here to enter text.	Click here to enter text.
5.	Click here to enter text.	Click here to enter text.	Click here to enter text.
6.	Click here to enter text.	Click here to enter text.	Click here to enter text.
7.	Click here to enter text.	Click here to enter text.	Click here to enter text.
8.	Click here to enter text.	Click here to enter text.	Click here to enter text.
9.	Click here to enter text.	Click here to enter text.	Click here to enter text.

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

High ← → Low

Probability	Severity				
	5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
5 - Frequent	25	20	15	10	5
4 - Probable	20	16	12	8	4
3 - Occasional	15	12	9	6	3
2 - Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

High ↕ Low

10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

AECOM

Americas

Task Hazard Assessment

S3AM-209-FM6

Date:	**Project Name / Location:** FOC Cheat River Trail
Permit / Job Number:	**Project Number:** 60589127
Description of Task: Site Visit and Soil Sampling	

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

- (•) **Yes** – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.
- ( ) **No** – list all steps, hazards, and precautions associated with the task in the form below.

Basic Task Steps (explain in order how the task will be carried out)	**Hazards** (identify all hazards & potential hazards of each step)	**Risk** (before)	**Control Measures / Precautions** (describe how that hazard will be controlled)	**Risk** (after)	**Revised?** (yes – record time)
			Highest Risk Index		

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

Originator _____ (Print Name) _____ (Signature)

Supervisor _____ (Print Name) _____ (Signature)

Risk Matrix on Reverse

THIS FORM IS TO BE KEPT ON JOB SITE.

AECOM

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time	Initials/Time	Initials/Time

Instructions:
Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

Emergency Contact #

Method of Communication

Risk Rating Matrix

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	<!=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

AECOM

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics**. This meeting is a daily refresher, not a full orientation**. Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name: Chris Channell
Phone Number: 304-381-9267

AECOM SH&E Rep. Name:
Phone Number:

Meeting Leader:

Date:	**Project Name/Location:** Cheat River Rail-Trail	**Project Number:** 60589127

Today's Scope of Work:

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**

1. Required Topics

- ☐ Fitness for Duty requirements, all sign in / sign out
- ☐ Required training (incl. task specific) completed and current
- ☐ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, hazards, controls, procedures, requirements, etc.)
- ☐ Pre-Job Hazard Assessments (JHA/JSAs) available and understood
- ☐ Task Hazard Assessments (THAs) are to be completed for each task immediately prior to conducting
- ☐ STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA
- ☐ Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition
- ☐ Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location
- ☐ Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all
- ☐ Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified
- ☐ Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
- ☐ Required checklists/records available, understood (describe):
- ☐ Lessons Learned / SH&E improvements (describe):

2. Discuss if Applicable to Today's Work

☑ ■ **Check ☑ as reviewed or mark ■ as not applicable**

- ☐ ☐ Biological/ Chemical / Electrical Hazards
- ☐ ☐ Ergonomics - Lifting, Body Position
- ☐ ☐ Lock Out/ Tag Out
- Short Service Employees - visual identifier and mentor/ oversight assignment
- ☐ ☐ Simultaneous/ Neighbouring Operations
- ☐ ☐ Slip/ Trip/ Fall Hazards
- ☐ ☐ Specialized PPE Needs
- ☐ ☐ Traffic Control
- ☐ ☐ Waste Management/ Decontamination
- ☐ ☐ Weather Hazards / Heat Stress / Cold Stress
- ☐ ☐ Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
- ☐ ☐ Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
- ☐ ☐ Other Topics (describe/attach):
- ☐ ☐ Client specific requirements (describe):

3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	**Signature**	**Date** **Time** **(at end of day / shift)**

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

All employees:

- **STOP WORK if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.**
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:

* The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
* The hazards & control measures associated with each task you are about to perform.
* The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
* That no tasks or work is to be performed without a hazard assessment.
* Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:

* You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
* You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
* You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
* You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: _____

SITE VISITOR / SITE REPRESENTATIVE

Name	Company Name	Arrival Time	Departure Time	Signature

Task Hazard Assessment Instructions:

Each unique task or work group should have their own THAs. If workers have a THA for their task(s) in hand, they should simply review it and document the site specific edits in red pen in the appropriate section. If workers do ***not*** have a THA for all tasks to be performed, a THA must be obtained or drafted *prior to starting work* on that task. Use additional pages as needed.

- Identify the basic steps of the task that must be performed in order and their associated hazards. Identify controls or barriers to mitigate each identified hazard.
- Clearly identify any **STOP WORK** triggers
- Document stop work and change management if conditions/ scope changes.
- Use 4-Sight to identify and mitigate site-specific hazards throughout the day. Modify the THA as needed. Contact site supervisors or the PM for any significant scope changes or changes of expected conditions.
- All THAs shall be 3 pages (maximum) or less (preferred). If they are longer, the task is too broad
- All hazards will use standardized nomenclature (Hazard Wheel), should be specific, detail how someone could be hurt and what the outcome could be
- All actions to mitigate hazards must be specific, clearly aligned with its respective hazard and not generic. Avoid words such as "*proper", "correct*", or "*appropriate*"). Use specifics and numerical values (i.e. wear disposable nitrile gloves, stand back 6 feet/1.8 meters, take a 10 minute break every hour)
- PPE cannot be the only line of defense - PPE is always the last line of defense, so think through what other controls (engineering, administrative, etc.) could mitigate hazards

Discuss as Applicable and Modify THA as Needed

Check ☑ if reviewed or mark N/A

- ☐ *Biological/ Chemical/ Electrical Hazards*
- ☐ *Decontamination Procedures*
- ☐ *Ergonomics- Lifting, Body Position*
- ☐ *Lock Out/ Tag Out*
- ☐ *Short Service Employees- visual identifier and mentor/ oversight assignment*
- ☐ *Simultaneous/ Neighboring Operations*
- ☐ *Slip/ Trip/ Fall Hazards*
- ☐ *Specialized PPE Needs*
- ☐ *Traffic Control*
- ☐ *Waste Management/ Decontamination*
- ☐ *Weather Hazards/ Heat Stress/ Cold Stress*
- ☐ *Work Permit requirements (identify):*
- ☐ *Other (describe):*

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Using the Matrix:

1. Identify basic steps of the task and associated hazards.
2. Calculate the initial risk rating.
3. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating.
4. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Attachment C

AECOM SH&E Field Applicable Procedures

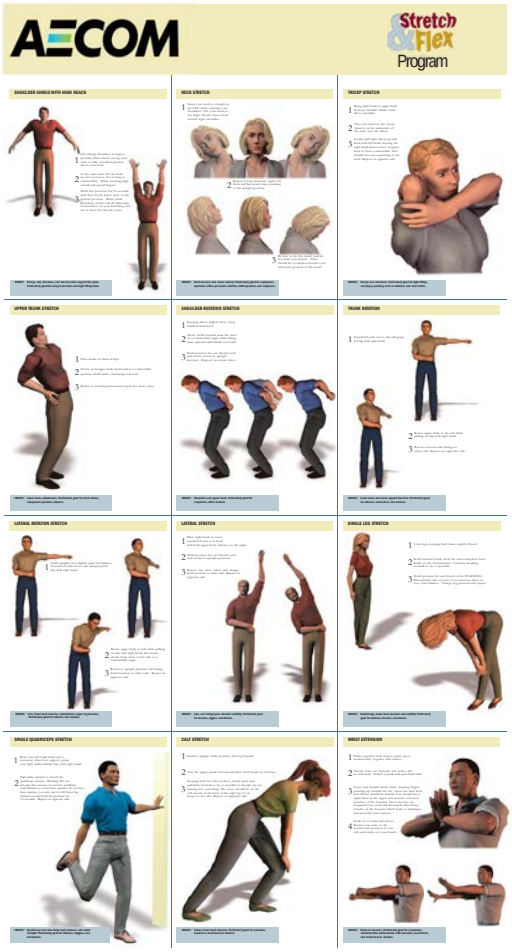
All AECOM SH&E Procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page.

Programmatic procedures referenced in this document (for example SH&E Training) DO NOT need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application MUST be printed in full and included in this section.

Copy the Field Procedure Checklist from the Physical Hazards Section 7 to become your table of contents for these attachments. Include only those procedures checked as applicable to this project

Attachment

Stretch/Flex Poster



Attachment D

Site Orientation

Attachment E. Site Orientation

AECOM will conduct a site safety briefing for a person's initial visit to the site. The briefing will be conducted:

- Prior to the start of work;
- For any new AECOM or subconsultant personnel; and
- At each mobilization, or whenever there is a change in task or significant change in task location.

All personnel working on the project who have received the site briefing (including the HASP review) will sign the Personal Acknowledgement located at the end of the HASP. Visitors may receive a shortened version to address the hazards specific to their visit.

The following items, at minimum, will be discussed during the site safety briefing:

- Contents of this HASP;
- The Emergency Response Plan;
- Contractor SH&E Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The THAs (**Attachment B**) for the tasks that will be performed on a given project;
- Types of hazards at the site and means for minimizing exposure to them;
- Instructions for new operations to be conducted, and safe work practices;
- PPE that must be used;
- Lone worker check-in procedures;
- Emergency evacuation routes, muster points, and tornado/storm shelters; and
- Location and use of emergency equipment.

These meetings must be documented and maintained in the project files.